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Isopod crustaceans from Shikoku, western Japan-2 Specimens from Kochi, Tokushima and Kagawa Prefectures *

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四国産等脚目甲殻類-2 高知,徳島,香川県産標本

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四国地方の海産, 陸産, 淡水産の等脚目甲殻類調査を行い, 第1報 (Nunomura, 2013) の愛媛県産の標本に続いて高知, 徳島, 香川県の等脚目甲殻類を報告する. 今回の資料は2011年から2013年にかけて黒潮生物研究財団の援助で実施した調査での等脚目甲殻類標本を中心に, 上野俊一, 坂東治夫, 吉田正隆, 石川和男, 芝実, 渡辺弘之, 堀越増興, 上田幸男, 酒井勝司, 青木淳一, 西川喜朗, 田中真悟, 細木光男氏はじめ多くの研究者から寄せられた標本, ならびに富山市科学博物館所蔵の標本の3つに分けられる.

本報告で海産39種, 淡水産3種, 陸産25種の計67種を確認し4種の新種及び1新亜種が見出されたので報告する. ホロタイプは陸産種と海産種は富山市科学博物館, 淡水種は国立科学博物館に保管され, パラタイプは富山市科学博物館と国立科学博物館に保管される.

キーワード: 等脚類, 新種, 高知県, 徳島県, 香川県, 四国, 分類学

Key words : Isopod, new species, Kochi, Tokushima, Kagawa, Shikoku, taxonomy,

Succeeding to the previous paper (Nunomura, 2013), this paper intended to represent the results on taxonomy of isopod crustaceans collected from Kochi, Tokushima and Kagawa Prefectures (Fig.1).

As the results of the above-mentioned survey, 67 isopod crustaceans including 39 marine species, 3 freshwater species, species and 25 terrestrial species will be reported and three species and a subspecies were proved to be new to science. The type material is deposited at Toyama Science Museum, Toyama (TOYA) and National Museum of Nature and Science, Tokyo (NSMT). Size of specimens is indicated by the body length (BL) measured from the midpoint of the anterior margin of the head to the midpoint of the posterior margin of the pleotelson.

Oder Isopoda
Suborder Oniscidea
Family Ligiidae
Ligia exotica Roux, 1828
(Japanese name: Funamushi)

Ligia exotica Roux, 1828, p. 3, pl. 13, fig. 9.

Material examined: 1♀, Akahana, Furue, Shodoshima-cho, Kagawa Pref., 24, May 2013, coll. Noboru Nunomura; 3♂♂, Murou, Shodoshima-cho, Kagawa Pref., 24, May 2013, coll. Noboru Nunomura; 3♂♂1♀, Enohama, Aji-cho,

*Contributions from Toyama Science Museum, No. 463

Takamatsu-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 2♀♀, Ado-ike, Hiketa, Higashikagawa-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 1♂, Oomiko-kaigan, Oohara, Tokushima-shi, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1♂2♀♀, Tainohama, Tainoura, Minami-cho, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 2♂♂, Yasakayahama, Asaka, Kaiyo-cho, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 3♀♀, near Toujin'nohama, Kan'noura, Toyo-cho, Kochi Pref., 26, May 2013, coll. Noboru Nunomura; 1♀, Kashimagaura, Saga, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 1♂1♀, Shirahama, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 1♂, Uranouchi-higashibun, Nomi, Suzaki-shi, Kochi Pref., 29, May 2013, coll. Noboru Nunomura; 2♂♂, Ooura, Sakanoshita, Sukumo-shi, Kochi Pref., 2, June 2012, Noboru Nunomura; 2♀♀(1♀ ovig.), Ishidomari, Ootsuki-cho, Kochi Pref., 4, June 2012, Noboru Nunomura; 7exs, Tatsukushi, Tosashimizu-shi, Kochi Pref., 23, Nov. 1976, coll. Noboru Nunomura.

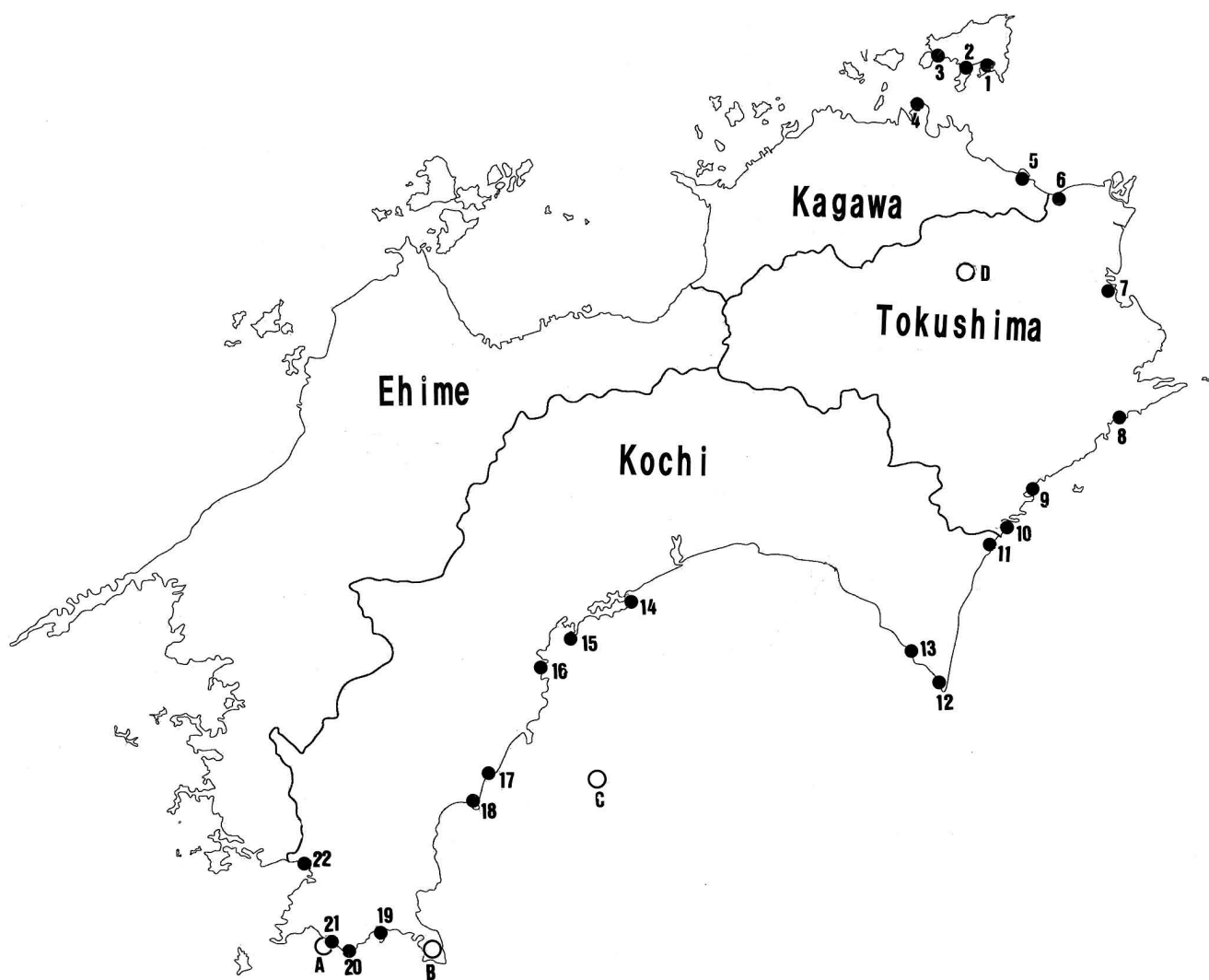


Fig. 1 Map showing main sampling sites. (1-22) and type localities of 4 new species (A-D).

1, Akahana (Shoudosihima-cho); 2, Murou (Shoudosihima-cho); 3, Nakayoshima (Tonosho-cho); 4, Enohama (Takamatsu-shi); 5, Adoike (Higashikagawa-shi); 6, Mitsu (Naruto-shi); 7, Oomiko (Tokushima-shi); 8, Tainohama (Anan-shi); 9, Yasakayahama (Kaiyo-cho); 10, Takegashima (Kaiyo-cho); 11, Kan'noura (Toyo-cho); 12, Muroto (Muroto-shi); 13, Hirao (Muroto-shi); 14, Usa (Tosa-shi); 15, Susaki; 16, Kure (Nakatosa-cho); 17, Saga (Kuroshiocho); 18, Shirahama (Kuroshio-cho); 19, Tsumajiro (Tosashimizu-shi); 20, Kosaitsuno (Otsuki-cho); 21, Nishidomari (Otsuki-cho); 22, Koura (Sukumo-shi); A, Nishidomari (Otsuki-cho); B, Cape Ashizuri, (Tosashimizu-shi); C, Tosa-Bay; D, Ichiba-cho.

***Ligia cinerascens* Budde-Lund, 1828**

(Japanese name: Kita-funamushi)

Ligia cinerascens Budde-Lund, 1828, p. 265.

Material examined: 1♀, mouth of Yoshinogawa, Tokushima-shi, Tokushima Pref., 17, May 2003, coll. Keiji Wada.

Remarks: This is perhaps the first record from Shikoku. Recently, Wada(2012) reported this species from Naruto-shi and Minami-cho, Tokushima Prefecture.

***Ligia* sp. (aff. *ryukyuensis* Nunomura, 1983)**

Material examined: 1♂2♀♀, Inojiri, Usa, Tosa-shi, Kochi Pref., 6, June 2012, Noboru Nunomura.

***Ligidium* (*Nipponoligidium*) *japonicum* Verhoeff, 1918**

(Japanese name: Nihon-himefunamsuhi)

Ligidium japonicum Verhoeff, 1918 Verhoeff, pp.114-117, fig.8-9.

Ligidium (*Nipponoligidium*) *japonicum* Verhoeff, 1918; Nunomura, 2004, p19.

Material examined: 2♀♀, Daitenboudai, Kanka-kei, Shodoshima-cho, Kagawa-Pref., 13, Mar. 1984, coll. Minoru Shiba; 19♀♀, Yasuhara-kamihiyoshi, Shioe-cho, Takamatsu-shi, Kagawa-Pref., 23, Oct., 1980, coll. Jun'ichi, Aoki; 1♂5♀♀, Tsurugi-san, Ichiu-son, Tokushima Pref., 4, Oct. 1981, coll. Shingo Tanaka; 3exs, secondary forest of evergreen forest, Orono, Kamiyama-cho, Tokushima Pref., 4, Oct. 1981, coll. Shingo Tanaka; 10exs. East of Torigatayama, Izumino, Niyodo-son, Kochi Pref., 20, Mar. 1976, coll. Yoshiaki Nishikawa; 3exs, Miyanokuchi, Tosayamada-cho, Kochi Pref.16, Apr. 1982, coll. Jiro Tsukamoto; 6exs, *Cryptomeria* forest of Yanase, Maji-mura, Kochi Pref., 1, Aug. 1975, coll. Hiroyuki Watanabe; 7exs, outside of Ryugado-cave, Tosayamada-cho, Kochi Pref., 26, Nov. 1976, coll. Yoshiaki, Nishikawa; 1ex, Oodou-kaigan, Ootsuki-cho, Kochi Pref., 19, Mar. 1978, coll. Yoshiaki Nishikawa; 5exs, Katsurahama, Kochi-shi, Kochi Pref., 24, Apr. 1977, coll. Kazuo Ishikawa; 1♀, *Castanopsis* forest, Taisho-cho, Kochi Pref., 22, Oct. 1977, coll. Kazuo Ishikawa; 1ex, Choja, Niyodo-cho, Kochi Pref., 20, Mar. 1976, coll. Yoshiaki Nishikawa; 3exs, Mt. Tsurugi-san, Marukasayama, Koyadaira-son, Tokushima Pref., 4, Nov. 1981, coll. Shingo Tanaka; 3exs, Kawakami natural forest, Koyadaira-son, Tokushima Pref., 4, Nov. 1981, coll. Shingo Tanaka; 1♀, Ashizuri, Misaki, Tosa-shimizu-shi, Kochi Pref., coll. Minoru Shiba.

Family Olibrinidae

***Olibrinus tosaensis* n.sp.**

(Japanese name: Tosa-higenaga-warajimushi)

(Figs.2-3)

Material examined: 2♂♂ (1♂ holotype, 3.4 mm in body length and 1♂ paratype, 3.5 mm in body length) and 4♀♀ (1♀ allotype, 3.6 mm in body length and 3♀♀ paratypes, 2.5-3.5 mm in body length), Shiuranohama, Nishidomari, Otsuki-cho, Kochi Pref., 17, May 2011, coll. Noboru Nunomura and Shu Nakachi. Type series is deposited as follows: Holotype (TOYA Cr-23591), allotype (TOYA Cr-23592), 2 paratypes (TOYA Cr-23593-23594) at Toyama Science Museum, 2 paratypes (NSMT-Cr22821) at National Museum of Nature and Science, Tokyo.

Other specimens: 2♂♂ (2.6-3.3 mm in body length) and 3♀♀ (2.5-3.4 mm in body length), Inojiri, Usa, Kochi Pref., 6, June 2012, coll. Noboru Nunomura; 1♀, Shiuranohama, Nishidomari, Otsuki-cho, Kochi Pref., 17, May 2011, coll. Shu Nakachi; 2♀♀, Nishidomari, Otsuki-cho, Kochi Pref., 18, May 2011, coll. Noboru Nunomura.

Description of male: Body ellipsoid, 2.9 times as long as wide. Color reddish brown. Anterior margin of cephalon with a transverse line. Eyes small, each composed of 5 ommatidia. Noduli lateralis (Fig. 3E) of each pereon somite located at almost equal distance from the lateral border. Pleon abruptly narrower than pereon. Posterior margin of pleotelson truncated.

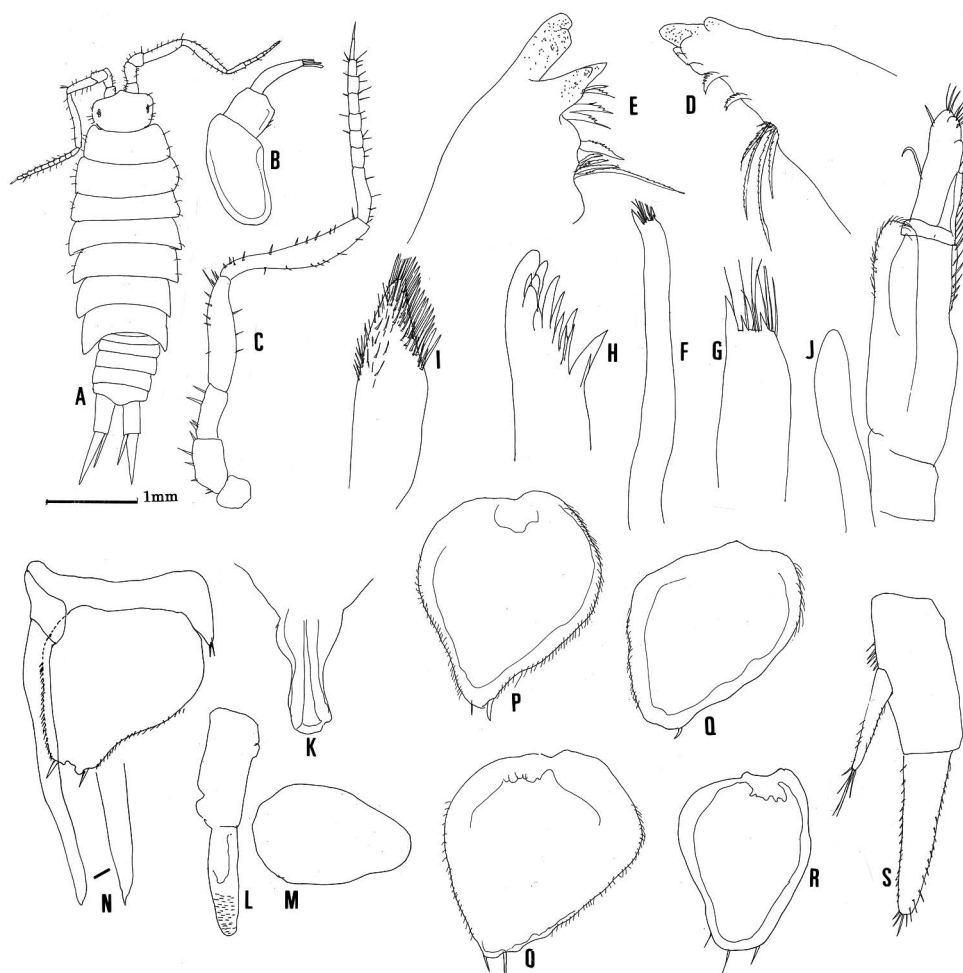


Fig. 2 *Olibrinus tosaensis* n.sp.

A, Dorsal view; B, Antennule; C, Antenna; D, Right mandible; E, Left mandible; F, Mesial endite of maxillula; G, Apical part of the same; H, Lateral endite of maxillula; I, Maxilla; J, Maxilliped; K, Penes; L, Endopod of male pleopod 1; M, Exopod of the same; N, Male pleopod 2; O, Exopod of female pleopod 2; P, Pleopod 3; Q, Exopod of pleopod 4; R, Exopod of pleopod 5; S, Uropod (A-N, P-S: holotype male; O, female).

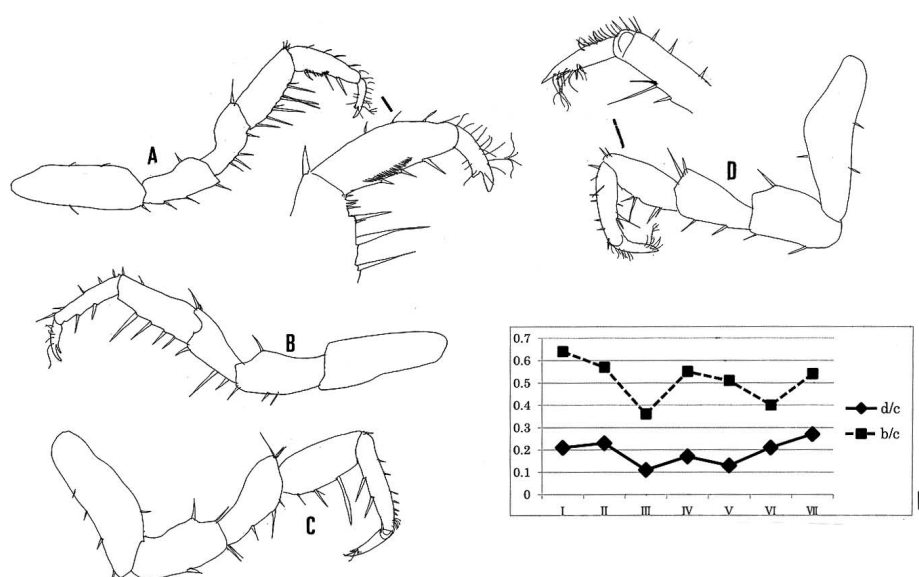


Fig. 3 *Olibrinus tosaensis* n.sp.

A-B, Pereopods 1-2; C, Pereopod 5; D, Pereopod 7; E, Position of noduli lateralis (All: Holotype male).

Antennule (Fig. 2B): terminal segment with 4-5 aesthetascs at the tip. Antenna (Fig. 2C), reaching the posterior area of third pereonal somite, flagellum composed of 8-10 segments.

Right mandible (Fig. 2D): pars incisiva with 3 teeth; lacinia mobilis represented by 4 teeth; processus molaris represented by 4-5 long setae. Left mandible (Fig. 2E): pars incisiva with 3 teeth; lacinia mobilis with 3 teeth; processus molaris represented by 4-5 long plumose setae. Maxillula (Fig. 2F-H): mesial endite with an acute tip and 2 small plumose setae; lateral endite with 13-14 teeth. Maxilla (Fig. 2I) narrow and heavily setose. Maxilliped (Fig. 2J): endite with a strong seta at the tip.

Pereopod 1 (Fig. 3A): basis 3 times as long as wide; ischium half-length of basis, with 3 setae on inner margin; merus a little shorter than ischium, with 4-5 setae on inner margin and a seta at outer distal angles; carpus 1.2 times longer than merus, with 6 longer and several shorter setae on inner margin; propodus with a series of short setae along inner margin; dactylus with a dactylar seta, several longer setae on both margins and a long seta on distal margin.

Pereopods 2-6 (Fig. 3B-C) similar in shape: basis 3.1 times as long as wide; ischium two-thirds as long as basis, 3 setae on inner margin and 1-2 setae on outer margin; merus two-thirds as long as ischium, with 3-5 setae on inner margin and 2 setae at outer distal angle; carpus almost as long as ischium, with 4-5 setae on inner margin; propodus a little shorter than carpus, with 2 setae on inner margin and several setae on outer margin; dactylus with a dactylar seta.

Pereopod 7 (Fig. 3D) similar to the preceding ones, but dactylus with a dactylar seta and a group of dense setae on both margins.

Penes (Fig. 2K) rather stout, with a ventral shield, surpassed by rounded orifices.

Pleopod 1 (Fig. 2L and M): endopod straight, with a tiny scales on distal half, tip rounded; exopod ovoid.

Pleopod 2 (Fig. 2N): endopod straight and tip sword-shaped; exopod rounded, with 2 setae on distal margin and with much fine setae around the margin.

Pleopod 3 (Fig. 2P): endopod small; exopod ovoid, with 2 setae and much fine setae on near basal half of the margin.

Pleopod 4 (Fig. 2Q): exopod ovoid, with a seta near the tip and much fine setae around the margin.

Pleopod 5 (Fig. 2R): exopod elliptical, with 3 setae.

Uropod (Fig. 2S): peduncle elongated and cylindrical: endopod narrow; exopod lanceolate.

Female: similar to male except sexual characters; exopod of pleopod 2 round, with 2 short setae (Fig. 2 O).

Etymology: "Tosa" means old name for Kochi Prefecture.

Remarks: The present new species is most closely allied to *Olibrinus kosugei* (Nunomura, 1992) reported from Okinawa Island, but the former is separated from the latter the latter in the following features: (1) shorter endopod of male pleopod 1, (2) shorter exopod of male pleopod 2, (3) bigger concavity of outer margin of exopod of the same, (4) less numerous setae of pereopods and (5) longer antennae.

The present new species is also similar to *Olibrinus pacificus* (Nunomura, 1990) recorded from Kushimoto, Kii Peninsula, but the former is separated in the following features: (1) longer body, (2) truncated posterior margin of pleotelson, (3) presence of a long seta on inner margin of carpus of pereopod 7, (4) presence of concavity on the exopod of male second pleopod, (5) less numerous setae on pereopod 7, (6) nearer position of noduli lateralis on pereonal somites and (7) shallower segmentation of maxillipedal palp.

Family Scyphacidae

Armadilloniscus japonicus Nunomura, 1984

(Japanese name: Nihon-hama-warajimushi)

Armadilloniscus japonicus Nunomura, 1984, p. 6, figs. 32-33 (Sakurajima-cho, Kagoshima Pref.)

Material examined: 6 ♀♀, near Kurohae, Nishidomare, Otuski-cho, Kochi Pref., 4, June 2012, coll. Noboru Nunomura; 1 ♂ 16 ♀♀, Nishidomari, Otsuki-cho, Kochi Pref., 17-18, May 2011, coll. Noboru Nunomura; 1 ♂ 2 ♀♀,

Inoshiri, Usa-shi, Kochi Pref., 6, June 2012, coll.Noboru Nunomura; 1♀, Kozukushichou-koura, Sukumo-shi, Kochi Pref., 18, May 2011. coll.Noboru Nunomura; 4♂♂17♀♀, Hachigasihiri, Nomi,Suzaki-sh, Kochi Pref., 29, May 2013, coll.Noboru Nunomura; 3♀♀, Yoshikawamachi, Muroto-shi, Kochi Pref., 20, May 2011, coll. Noboru Nunomura; 1♀, Nishiyuki, Yuki-cho, Tokushima Pref., 18, May 1998, coll. Noboru Nunomura(TOYACr-22869).

***Armadilloniscus notojimeneis* (Nunomura,1990)**

(Japanese name: Noto-chouchin-warajimushi)

(Fig.4)

Koshiniscus notojimensis Nunomura, 1990 , p. 51, figs. 163-164 (Notojima I, Ishikawa Pref.).

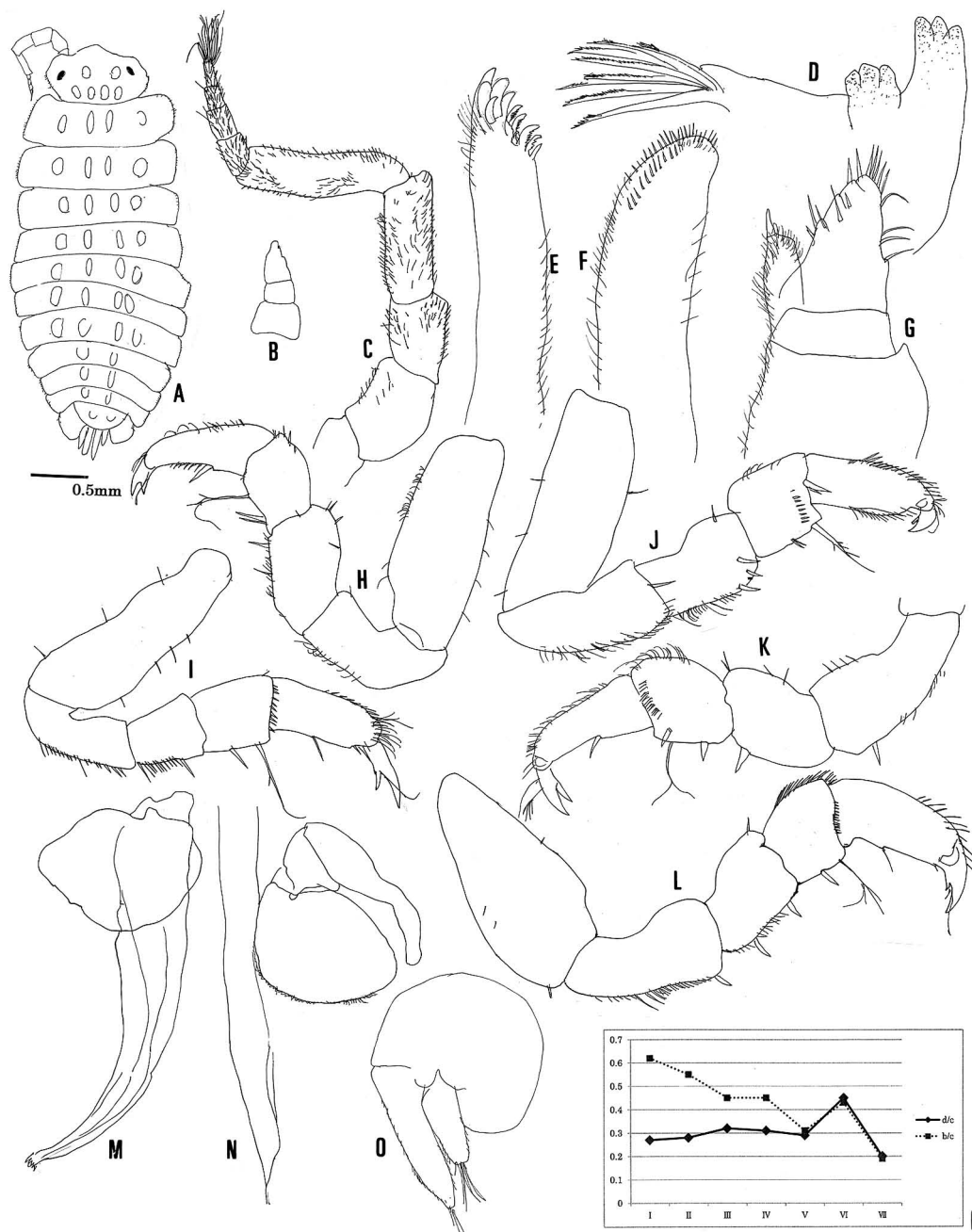


Fig. 4 *Armadilloniscus notojimensis* (Nunomura, 1990)

A, Dorsal view; B, Antennule; C, Antenna; D, Mandible; E Lateral endite of maxillula; F, Maxilla; G, Maxilliped; H, Pereopod 1; I, Pereopod 3; J-L, Pereopods 5-7; M, Male pleopod 1; N, Male pleopod 2; O, Uropod 3; Position of noduli lateralis (All: a male from Otsuki)

Armadilloniscus notojimensis (Kwon, 1995) p.515.

Material examined: 1♂1♀, near Kurohae, Nishidomarei, Otuski-cho, Kochi, Pref., 17-18, May 2011, coll. Noboru Nunomura; 1♀, near Kurohae, Nishidomarei, Otuski-cho, Kochi Pref., 4, June 2012, coll. Noboru Nunomura; 2♀♀, Inoshiri, Usa-shi, Kochi Pref., 6, June 2012, coll. Noboru Nunomura; 2♀♀, Hachigashiri, Nomi, Suzaki-shi, Kochi Pref. 29, May 2013, coll. Noboru Nunomura.

Remarks: The specimens from Shikoku shows the slight difference from the original description: (1) presence of long multi-branched setae on inner surface of carpus (Fig 4H-L), (2) lack of distinct knob on endopod of male pleopod 1. (Fig 4M), (3) jagged tip of the same and (4) stouter endopod of male pleopod 2, (Fig 4N).

The figure of antennules of the original description (Nunomura, 1990) was inadequate: it was not antennule but another appendage. Therefore, I reexamined it. (Fig 4B), but unfortunately no aesthetascs observed. And in original description, the position of noduli lateralis was not described, therefore, I examined on the specimens from Kochi (Fig 4P).

Family Alloniscidae

Alloniscus balssi (Verhoeff, 1928)

(Japanese name: Nihon-tama-warajimushi)

Japanoniscus balssi Verhoeff, 1928, 32, figs. 7-16.

Alloniscus balssi Arcangeli, 1965. Nunomura, 1999a, p. 87.

Material examined: 4♂♂1♀, Oomiko-kaigan, Oohara, Tokushima-shi, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1♂1♀, Hachigashiri, Nomi, Suzaki-shi, Kochi Pref., 29, May 2013, coll. Noboru Nunomura.

Family Halophilosciidae

Littorophiloscia nipponensis Nunomura, 1986

(Japanese name: Nippon-hihiro-warajimushi)

Littorophiloscia nipponensis Nunomura, 1986 p. 10, fig. 61 (Akasaki, Uchiura-cho, Ishikawa Pref.).

Material examined: 5♂♂16♀♀, Nishidomari, Otsuki-cho, Kochi Pref., 17, May 2011, coll. Noboru Nunomura; 3♂♂4♀♀, Kashimagaura, Saga, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura.

Family Philosciidae

Burmoniscus japonicus (Nunomura, 1986)

(Japanese name: Yamato-mori-warajimushi)

Setaphora japonica Nunomura, 1986, p. 22, figs. 68-69 (Fujishirozaka, Kainan, Wakayama Pref.).

Burmoniscus japonicus (Nunomura, 1986) 1999a, p. 87.

Material examined: 3♂♂1♀, Oomiko-kaigan, Oohara, Tokushima-shi, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1♀, Tainohama, Tai, Minami-cho, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1♂2♀♀, Katsurahama, Kochi-shi, Kochi Pref., 29, Apr. 1977, coll. Kazuo Ishikawa; 1♂3♀♀, Seiryu-ji, Usa-shi, Kochi Pref., 3, Apr. 1977, coll. Kazuo Ishikawa; 5♂♂12♀♀, *Castanopsis*-forest, Tosa-shi, Kochi Pref., 28, Aug. 1978, coll. Kazuo Ishikawa; 3♀♀, Usa-shi, Kochi Pref., 28, Aug. 1978, coll. Minoru Shiba; 1♀, Hachigashiri, Nomi, Suzaki-shi, Kochi Pref., 29, May 2013, coll. Noboru Nunomura; 3♂♂5♀♀ (1♀ovigerous), Ohno, Kure, Nakatosa-cho, Kochi Pref., 29, May 2013, coll. Noboru Nunomura; 1♀, Tsukushi-cho, Sukumo-shi, Kochi Pref., 12, Dec. 1978, coll. Minoru Shiba; 1♂3♀♀, Nishidomari, Otsuki-cho, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 1♂6♀♀, Okinoshima, Sukumo-shi, Kochi Pref., 19, Aug. 1980, coll. Minoru Shiba; 5♀♀5y, near Light House of Ashizuri Misaki, Tosa-shimizu-shi, Kochi Pref., 7, June 1980, coll. Minoru Shiba.

***Burmoniscus murotoensis* (Nunomura, 1986)**

(Japanese name: Muroto-mori-warajimushi)

Setaphora murotoensis Nunomura, 1986 p. 25, figs. 70-71 (Sakiyama, Muroto City, Kochi Pref.).

Burmoniscus murotoensis (Nunomura, 1986) Nunomura 1999a, p. 87.

Material examined: 8exs, Cape Muroto, Muroto-shi, Kochi Pref., 6, Mar. 1980, coll. Jun'ichi Aoki, (type series); 1♂1♀, Hiwasa-cho, Tokushima Pref., 28, June 1980 coll. Minoru Shiba, coll. Hiroshi Harada; 5exs, Sakiyama, Muroto-shi, Kochi Pref., 6, Mar. 1980, coll. Jun'ichi Aoki; 1♀, Katsara-hama, Kochi-shi, Kochi Pref., 22, Nov. 1976, coll. Noboru Nunomura; 1♂, Ashizuri "Mountain Highway", Tosashimizu-shi, Kochi Pref., 11 Oct. 1982, coll. Minoru Shiba; 3♂14♂♀♀, Sarugataki, Motoyama-cho, Kochi Pref., 24, Aug. 1981, coll. Kazuo Ishikawa.

***Pseudophiloscia tsukamotoi* Nunomura, 1986**

(Japanese name; Tsukamoto-himewarajimuhi)

Pseudophiloscia tsukamotoi Nunomura, 1986, p. 62, fig. 94 (Hirose, Towa-mura, Hata-gun, Kochi Pref.).

Material examined: 1♂3♀♀, Hirose, Towa-mura, Kochi Pref., 8, May 1981, coll. Jiro Tsukamoto (Type series: TOYA Cr-5372-5374).

Family Agnaridae

***Lucasioides sinuosus* (Nunomura, 1987)**

(Japanese name: Namiberi-warajimushi)

Nagurus sinuosus Nunomura, 1987, p. 10, fig. 104 (Mitsutsuji-yama, Tosa-cho, Kochi Pref.).

Lucasioides sinuosus (Nunomura, 1987) Nunomura, 1999a, p. 87.

Material examined: 2♂♂3♀♀, Mitsuiyama, Tosa-cho, Kochi Pref., 25, July 1976, coll. Yoshiaki Nishikawa (type series); 3♂♂5♀♀, Kochi Prefectural Forest Exp. Stn. Tosayamada-cho, Kagami-shi, Kochi Pref., 16, Apr. 1982, coll. Jiro Tsukamoto; 1♂, Konose-kyo, 500m, Kito-son, Tokushima Pref., 27, Sep. 1999, Shuhei Nomura; 1♂, Mt. Nakatsu, Myojin, yama, 1300m, Awa-mura(present: Niyodogaswa-cho), Kochi Pref., 29, Sep. 1999, coll. Shuhei Nomura; 1♀, Hachigashiri, Nomi, Suzaki-shi, Kochi Pref., 29, May 2013, coll. Noboru Nunomura; 2♀♀, Michizaki, Shimoda, Shimanto-shi, Kochi Pref., 18, May 2011, coll. Noboru Nunomura.

***Lucasioides nishimurai* (Nunomura, 1987)**

(Japanese name: Satoyama-hayashi-warajimushi, new)

Nagurus nishimurai Nunomura, 1987, p. 17, fig. 107 (Rinkai, Seto; Shirahama, Wakayama Pref.)

Lucasioides nishimurai, Nunomura, 1999a, p. 87.

Material examined: 1♂10♀♀, Mt. Tsukimiyama, 50 m, Kagami-cho, Kochi Pref., 28 Sep. 1999, coll. Shuhei Nomura; 1♂, Nanzan, 90m, Takase-cho, Kagawa Pref., 15, May 2001, coll. Keisuke Nishikawa; 12exs, Katsurahama, Kochi-shi, Kochi Pref., 22, Nov. 1976, coll. Noboru Nunomura; 6exs, Muroto-shi, Kochi Pref., 9, Sep. 1982, coll. Jiro Tsukamoto; 6exs, Ooasahikojinja, Hirakusa, Ooasa-cho, Naruto-shi, Tokushima Pref., 18, Mar. 1976, coll. Yoshiaki Nishikawa; 2exs, Muroto-shi, Kochi Pref., 9, Sep. 1982, coll. Jiro Tsukamoto; 1ex, Cape Ashizuri-tengunohana, Tosashimizu-shi, Kochi Pref., 23, Nov. 1976, coll. Noboru Nunomura.

***Lucasioides* sp.**

(Figs.5-6)

Material examined: 1♂(5.0mm in body length) and 2♀♀ (5.1-5.2 mm in body length, *Cryptomeria* forest, Yanase, Umaji-mura, Kochi Pref., 1, Aug. 1975, coll. Hiroyuki Watanabe. These specimens are deposited at Toyama Science Museum (TOYA Cr 23586-23688).

Description of male: Body ellipsoid, 2.0 times as long as wide. Color pale brown, with many irregular darker patterns. Anterior margin of cephalon with a distinct lateral lobes, linea frontalis bow-shaped; linea supra

antennalis slightly convex. Postero-lateral margin of pereonal somite 1 rounded, without depression. Noduli lateralis (Fig. 5Q) on pereonal somites, 2 and 4 relatively remote from its larder. Posterior margin of pleotelson triangular, without any concavities on lateral margins.

Antennule (Fig. 5C) three-segmented; terminal segment with 2 aesthetascs at the tip. Antenna (Fig. 5D), reaching posterior half of pereonal somite 1; pereonal segments, with 5 peduncular and 2 flagellar segments, terminal flagellar segment 2.5 times longer than the basal one.

Right mandible (Fig. 5E): pars incisiva with 4 teeth; lacinia mobilis two-toothed; processus molaris represented by a tuft of setae. Left mandible (Fig. 5F): pars incisiva with 3 teeth, lacinia mobilis single-toothed; 4 penicils; processus molaris represented by a tuft of setae. Maxillula (Fig. 5G and H): lateral endite with 10 simple setae on its apical margin; mesial endite with 2 plumose setae and an acute projection on lateral distal corner. Maxilla (Fig. 5I and J): lateral endite with 10 simple setae on its apical margin; mesial endite with 2 plumose setae and an acute projection on lateral distal corner. Maxilla

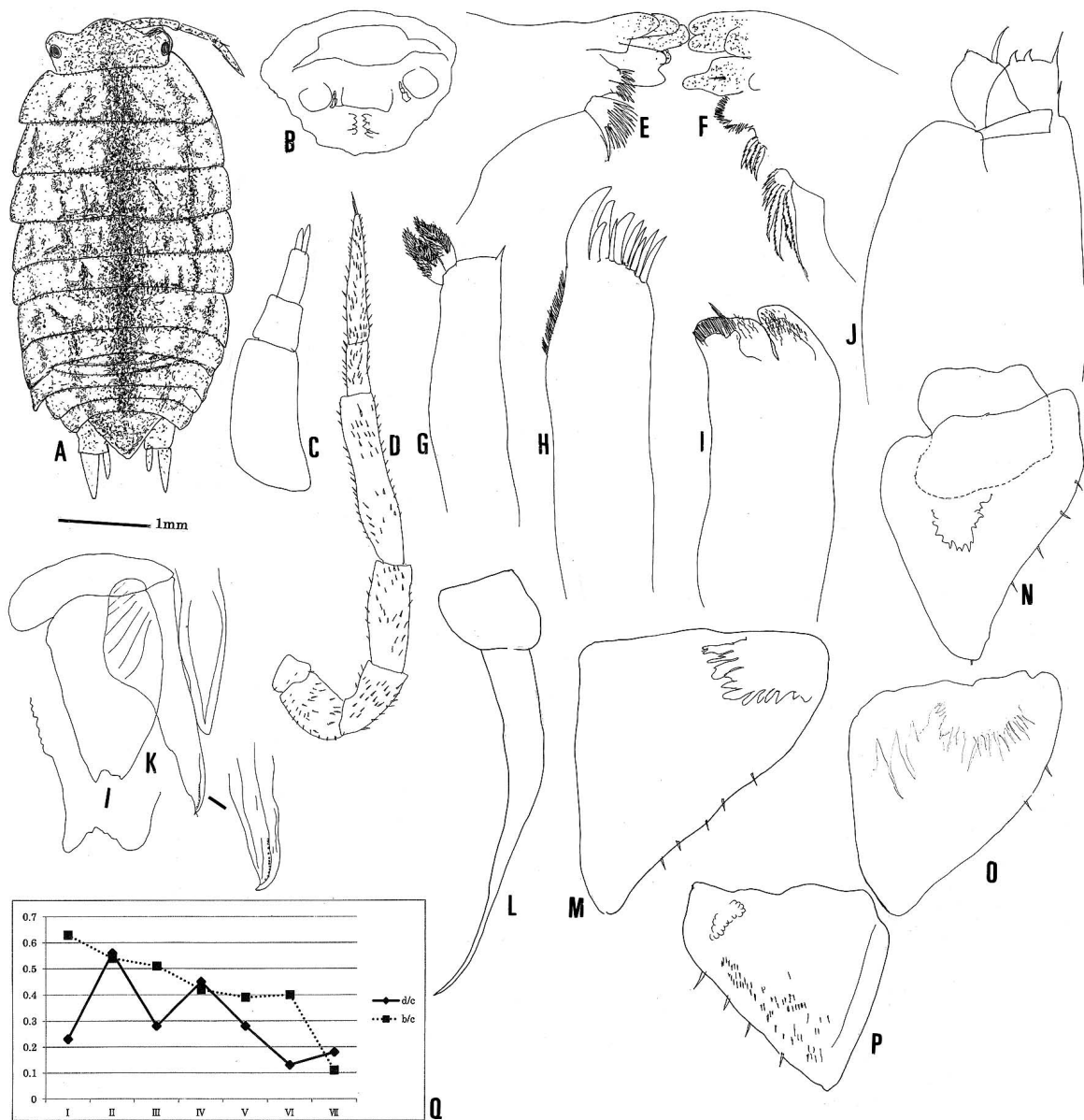


Fig. 5 *Lucasioides* sp.

A, Dorsal view; B, Frontal view of cephalon; C, Antennule; D, Antenna, E, Right mandible; F, Left mandible; G, Mesial endite of maxillula; H, Lateral endite of the same; I, Maxilla; J, Maxilliped; K, Penes and male pleopod 1; L, Endopod of male pleopod 2; M, Exopod of the same; N, Pleopod 3; O, Exopod of pleopod 4; P, Exopod of pleopod 5; Q, Position of noduli lateralis (All: a male form Umaji).

(Fig. 5I): apically bilobed, with wide area of sensilla on inner lobe and outer lobe relatively narrow. Maxilliped (Fig. 5J): endite apically with 2 cusps and a strong seta; palp short; segment 2 with proximal segment bearing a relatively long seta.

Pereopod 1 (Fig. 6A): basis 3.0 times as long as wide; ischium half-length of basis; merus a little shorter than ischium; carpus a little longer than merus, with wide area of antenna grooming brushes on frontal surface; propodus with a series of short setae on basal half and 4 setae on distal half of the inner margin.

Pereopod 2 (Fig. 6B): basis 3.4 times as long as wide; ischium half-length of basis; merus and carpus with dense setae on inner margin; propodus a little longer than carpus.

Pereopods 3-5 (Fig. 6C-D) similar in shape: basis 3.7 times as long as wide; ischium, merus and carpus with 8-13 setae on inner margin.

Pereopod 6 (Fig. 6E) similar to pereopod 5, but basis with relatively densely setae on inner distal area.

Pereopod 7 (Fig. 6F) similar to pereopod 6, but a little longer: ischium bears 7-8 setae on outer margin.

Penes (Fig. 5K) fusiform, 3.7 times as long as wide.

Pleopod 1 (Fig. 5K): endopod relatively stout, with a small and acute tip; exopod rectangular, 1.7 times as long as wide, with slightly sinuate outer margin and a concavity on distal margin.

Pleopod 2 (Fig. 5L and M): endopod long; exopod triangular, with 5 setae on outer margin.

Pleopod 3 (Fig. 5N.): exopod triangular, with 4 setae on outer margin.

Pleopod 4 (Fig. 5O): exopod triangular, with 2 setae on outer margin.

Pleopod 5 (Fig. 5P): exopod triangular, with 4 setae on outer margin and pectinated scales on outer area.

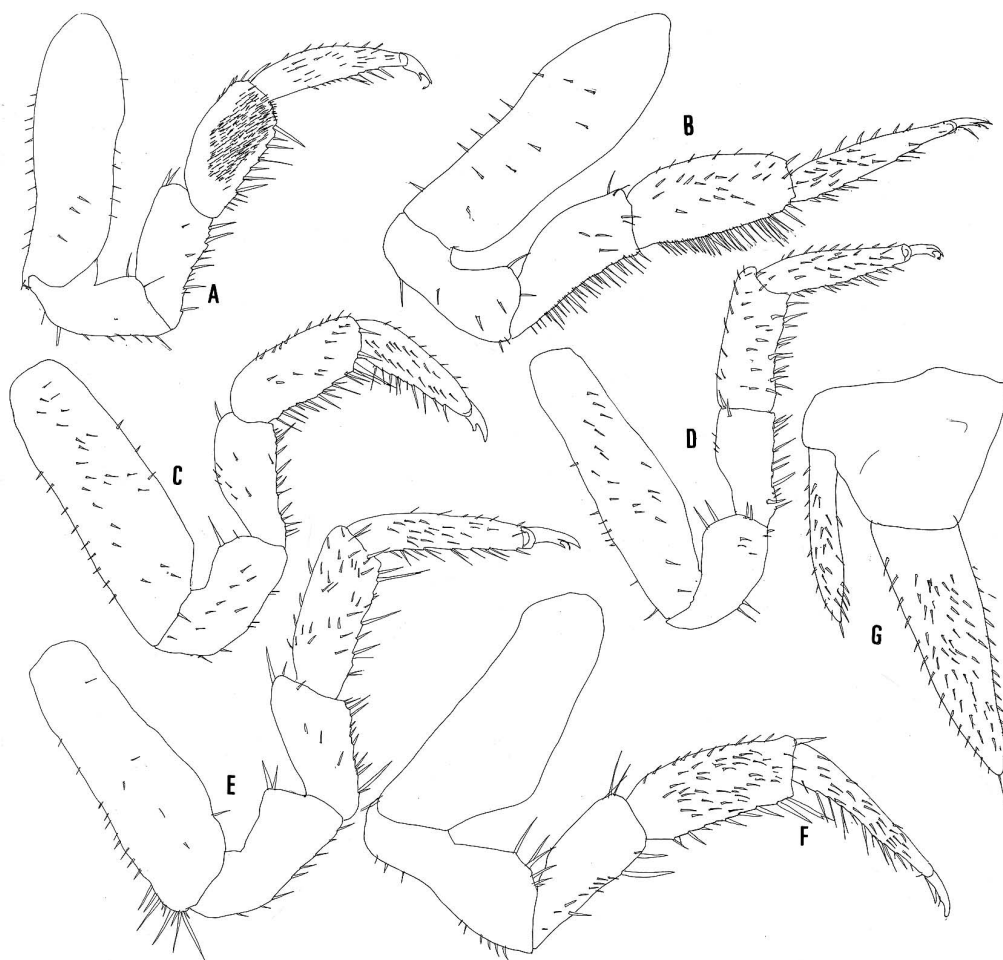


Fig. 6 *Lucasioides* sp.

A-C, Pereopods 1-3; D-F, Pereopods 5-7; G, Uropod (All: a male form Umaji).

Uropod (Fig.): peduncle square, 0.8 times as long as wide; endopod slender, 5.5 times as long as wide; exopod rather stout, 2.9 times as long as wide and 1.6 time longer than basis.

Female similar except for sexual characters.

Remarks: The present new species is allied to *Lucasioides minatoi* (Nunomura, 1987) recorded from a cave of Yura Wakayama, but it differs in the following features : (1) deeper depression of concavity of exopod male first pleopod, (2) serrated outer margin of the same, (3) longer endopod of male second pleopod, (4) nearer position from lateral border of noduli lateralis of pereonal somites 2-4, (5) not sinuated of posterior margin of pereonal somite 1 and (6) less numerous aesthetascs of antennule.

***Mongoloniscus* sp. (aff. *maculatus* (Iwamoto, 1943))**

Material examined: 1♀m Ohno, Nakatoa-cho, Kochi Pref., 29, May, 2013, coll. Noboru Nunomura.

***Agnara awaensis* (Nunomura, 1987)**

(Japanese name: Awa-sato-warajimushi)

Protrachaeoniscus awaensis Nunomura, 1987, p. 59, fig. (Bizan, Tokushima City, Tokushima Pref.).

Agnara awaensis Nunomura 1999. p82. and 89.

Material examined: 1♂5♀♀, Bizan, Tokushima-shi, Tokushima Pref., 20, Oct. 1979, coll. Hiroshi Harada (type series).

***Agnara shibai* n.sp.**

(Japanese name: Tosa-hina-warajimuhsi, new)

(Fig.7-8)

Material examined: 1♂ (holotype, 2.9 mm in body length), behind of Torii gate way of Shirao-jinja, Ashizurimisaki, Tosashimizu-shi, Kochi Pref. 11, Oct. 1982, coll. Minoru Shiba, and 1♂(paratype, 2.4 mm in body length), Usa, Tosa-shi, Kochi Pref., 29, Aug. 1978, coll. Minoru Shiba. Holotype (TOYA Cr- 23589) and a paratype (TOYA Cr- 23590) are deposited at Toyama Science Museum.

Other specimens: 1♀(4.4mm in length), Kankakei, Shodo-shima Island, Kagawa Pref., coll. Minoru Shiba; 1♀, Kawakami, Koyadaira-son, Tokushima Pref., 4, Oct. 1981, coll. Shingo Tanaka.

Description of male: Body (Fig. 7A) ellipsoid, 1.9 times as long as wide. Color pale brown, with two lines of darker longitudinal line and a pair of discontinuous longitudinal patterns on the outside of dorsal surface. Anterior margin of cephalon (Fig 7B): linea frontalis curved. Eyes small, each with about 18 ommatidia. Noduli lateralis (Fig. 7R) on pereonal somites 2-7 relatively remote from each lateral margin (Fig. 7R). Posterior margin of pleotelson rounded.

Antennule (Fig. 7C): terminal segment with 6 aesthetascs at the tip. Antenna (Fig. 7D): flagellum two-segmented, second flagellar segment, 4.0 times longer than the first one.

Right mandible (Fig. 7E): pars incisiva with 4 teeth, lacinia mobilis single-toothed; 2 penicils; processus molaris represented by a tuft of setae. Left mandible (Fig. 7F): pars incisiva with 4 teeth, lacinia mobilis 3-toothed; 3 penicils; processus molaris represented by a tuft of setae. Maxillula (Fig. 7G): lateral endite with 10 simple setae on apical margin; mesial endite with 2 plumose setae on distal margin and a short projection on lateral distal corner. Maxilla (Fig. 7 H): apically bilobed, with area of sensilla on inner lobe; outer lobe narrow. Maxilliped (Fig. 7I): endite apically with 3 cusps and a strong seta; palp three-segmented, segment 2 with proximal segment bearing a tuft of setae.

Pereopod 1 (Fig. 8A-B): basis 2.4 times as long as wide; ischium two-thirds as long as basis, with 11-12 setae on inner margin; merus with 9-10 setae on inner margin; carpus (Fig. 8B) with wide area of antenna-grooming brush on frontal surface and a series of long setae on inner margin; propodus with a series of short setae on basal half on inner margin and 2 setae on distal half of the same.

Pereopod 2 (Fig. 8C) a little longer than pereopod 1; inner margin of merus and carpus with relatively longer setae.

Pereopod 3 (Fig. 8D) similar to pereopod 2, but with less numerous setae on merus and carpus.

Pereopods 4-6 (Fig. 8E-G) similar in shape; merus and carpus with fewer setae than pereopod that 3 on inner margin.

Pereopod 7 (Fig. 8H) similar to the pereopods 4-6, but more setae on inner margin of merus and carpus.

Penes (Fig. 7J) fusiform; 4.5 times as long as wide.

Pleopod 1 (Fig. 7K and L): endopod straight, with rounded apical margin bearing many denticles; exopod semicircular, without seta.

Pleopod 2 (Fig. 7M): basis short; endopod long and exceeds beyond the tip of exopod; exopod elongated triangular, 2.2 times longer than endopod, with 5 setae on outer margin.

Pleopod 3 (Fig. 7N): exopod triangular, with 4 setae on outer margin.

Pleopod 4 (Fig. 7O): exopod triangular, with 7 setae on outer margin.

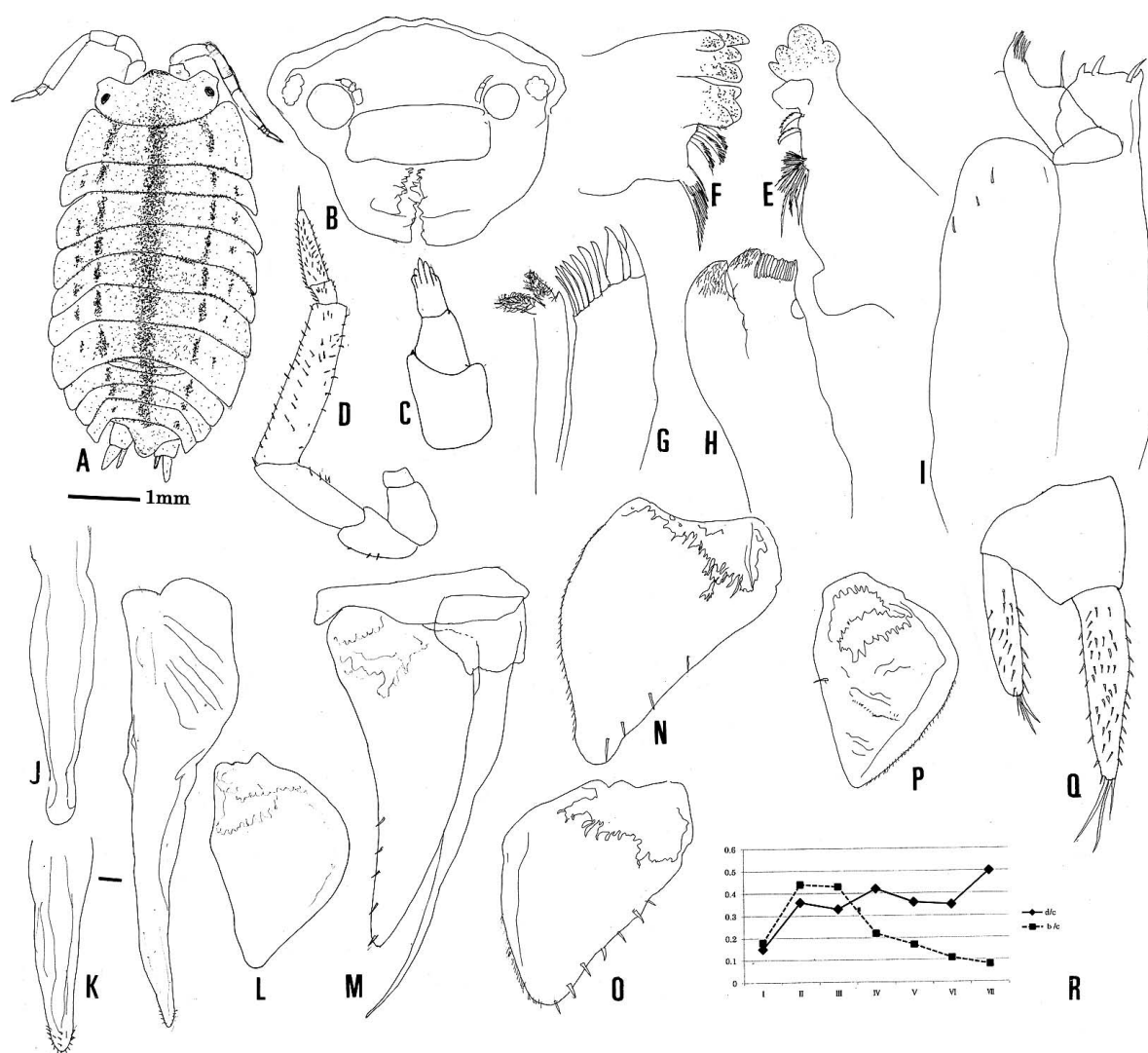


Fig. 7 *Agnara shibai* n.sp.

A, Dorsal view; B, Frontal view of cephalon; C, Antennule; D, Antenna; E, Right mandible; F, Left mandible; G, Maxillula; H, Maxilla; I, Maxilliped; J, Penes; K, Male pleopod 1; L, Exopod of the same; M, Male pleopod 2; N, Exopod of Pleopod 3; O, Exopod of pleopod 4; P, Exopod of pleopod 5; Q, Uropod; R, Position of noduli lateralis (All: holotype male).

Pleopod 5 (Fig.7P): exopod triangular, with pectinated scales and a seta on outer margin.

Uropod (Fig.7Q) : peduncle square, almost as long as wide; endopod with many setae on surface and 3 setae at the tip; exopod slender, three-fourths as long as wide, with 2 setae at the tip.

Female similar except for sexual characters.

Etymology : The species name is dedicated to Dr. Minoru Shiba, collector of the present specimens and the specialist of prostigmatid acari.

Remarks: The present new species is also most closely allied to *A. circacaudata* recorded from Tokuyama, Yamaguchi Prefecture in having rounded posterior margin of pleotelson. But the former is separated from the latter in the following features: (1) color pattern, presence of longitudinal darker patterns, (2) shape of exopod male pleopod 1, especially absence of any concavity, (3) longer endopod of male pleopod 2, (4) protruded lateral of lateral lobe of cephalon and (5) smaller eyes.

The present new species is also allied to *Agnara awaensis* (Nunomura, 1987), recorded from Tokushima Prefecture, but the former is separated from the latter in the following features: (1) color patterns, presence of longitudinal darker patterns, (2) round pleotelson, (3) shape of exopod of male pleopod 1, especially absence of any concavity, (4) less numerous setae on pereopod 1, (5) absence of bifid teeth on lateral endite of maxillula, (6) lack of projection on endopod of male pleopod 2, (7) longer endopod of male pleopod 1 and (8) numerous aesthetascs of antennule.

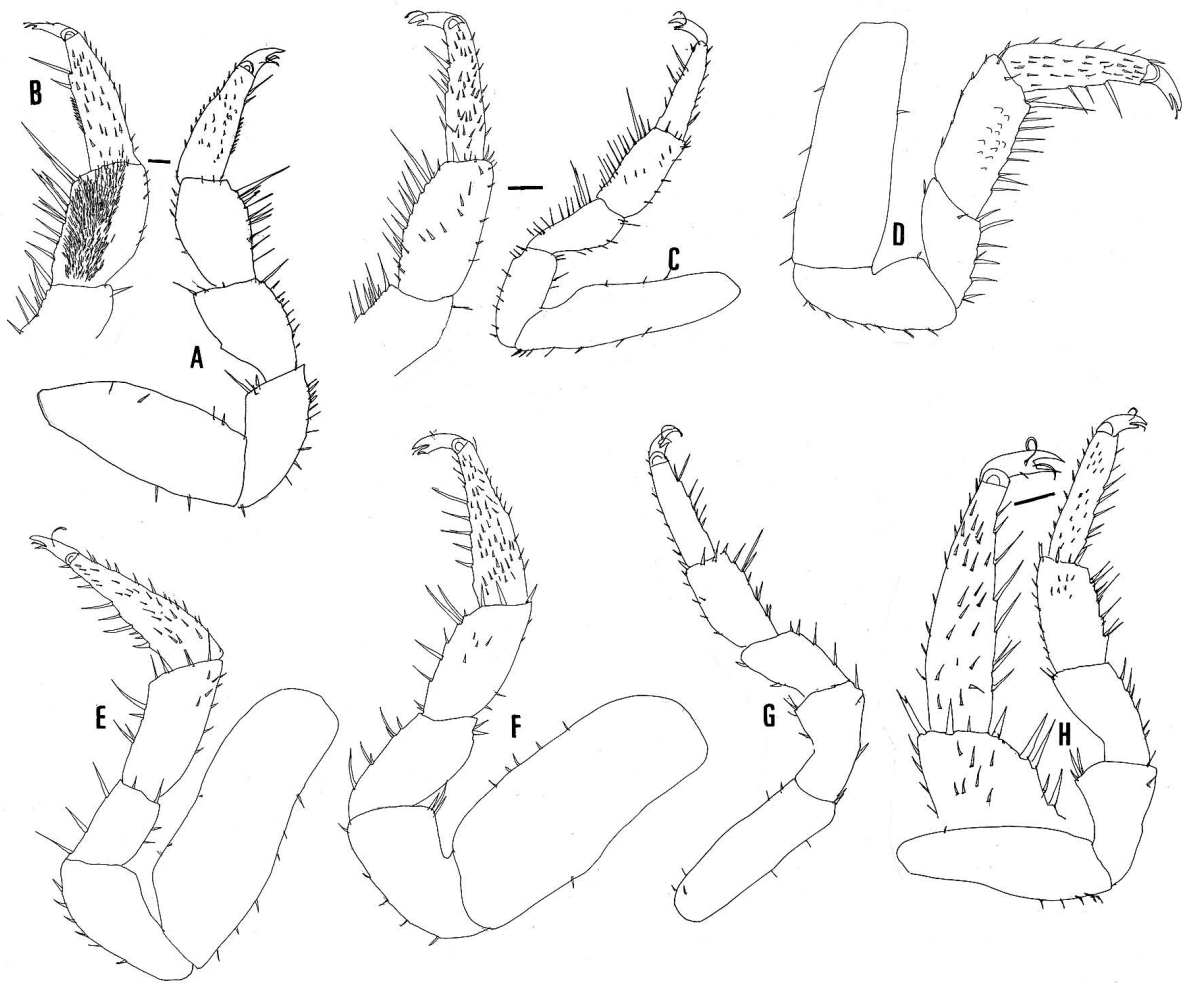


Fig. 8 *Agnara shibai* n.sp.

A, Pereopod 1; B, Frontal surface of the same; C-H, Pereopods 2-7(All: holotype male).

***Spherillo punctatus* Nunomura, 2007**
(Japanese name: Hanten-koshibiro-dangomushi)
(Fig.9)

Spherillo punctatus Nunomura, 2007, p.33-35, Fig.9. (Hachijo Island).

Material examined: 3♂♂ (4.0-6.1mm in body length) and 10♀♀ (4.0-7.7mm in body length) from a Forest near the lodging of The Biological Institute on Kuroshio, Nishidomari, Otsuki-cho, Kochi Pref., 28, May 2013, coll. Noboru Nunomura.

Remarks: This is the first record of the species from Shikoku. The present specimens agree with original description (Nunomura, 2007), but show the following different features: (1) more bifurcated or trifurcated setae on inner side of pereopod (Fig. 9 D-H), (2) lower projection or sternal male of male seventh pereopod (Fig. 9H), (3) serrated exopod of exopod of male first pleopod (Fig. 9I) and (4) acuter tip of both rami of male second pleopod (Fig. 9J). Brush of propodus on frontal surface of pereopod 1 (Fig. 9D) is newly described.



Fig. 9 *Spherillo punctatus* Nunomura, 2007

A, Dorsal view; B, Antennule; C Antenna; D, Pereopod 1; E, Pereopod 3; F-H, Pereopods 5-7; I Penes and male pleopod 1; J, Male pleopod 2 (All: male from Otsuki-cho).

***Spherillo pachysetifer* Nunomura, 2013**
(Japanese name: Futoge-koshibiro-dangomushi)
(Fig.10)

Spherillo pachysetifer Nunomura, 2013, pp.47-50, fig.16-17. (Uwajima Ehime Pref.).

Material examined: 1♂2♀♀, ground of a temple, near Cape Ashizurimisaki, Tosashimizu-shi, Kochi Pref., 1, Mar. 1977, coll. Kazuo Ishikawa; 2♂♂14♀♀, Hotsumisakiji-temple, 200m, Muroto-Misaki. Muroto-shi, Kochi Pref., 28, Sep.1999, coll. Shuhei Nomura; 3♂♂6♀♀, Muroto-misaki. Muroto-shi, Kochi Pref., 28, Sep. 1999, coll. Shuhei Nomura; 1♂3♀♀, Konosekyo-valley, 600m, Kiso-son, Tokushima Pref., 27, Sep. 1999, coll. Shuhei Nomura.

Remarks: Specimens from Umaji-mura agrees with original description(Nunomura, 2013), but show the following

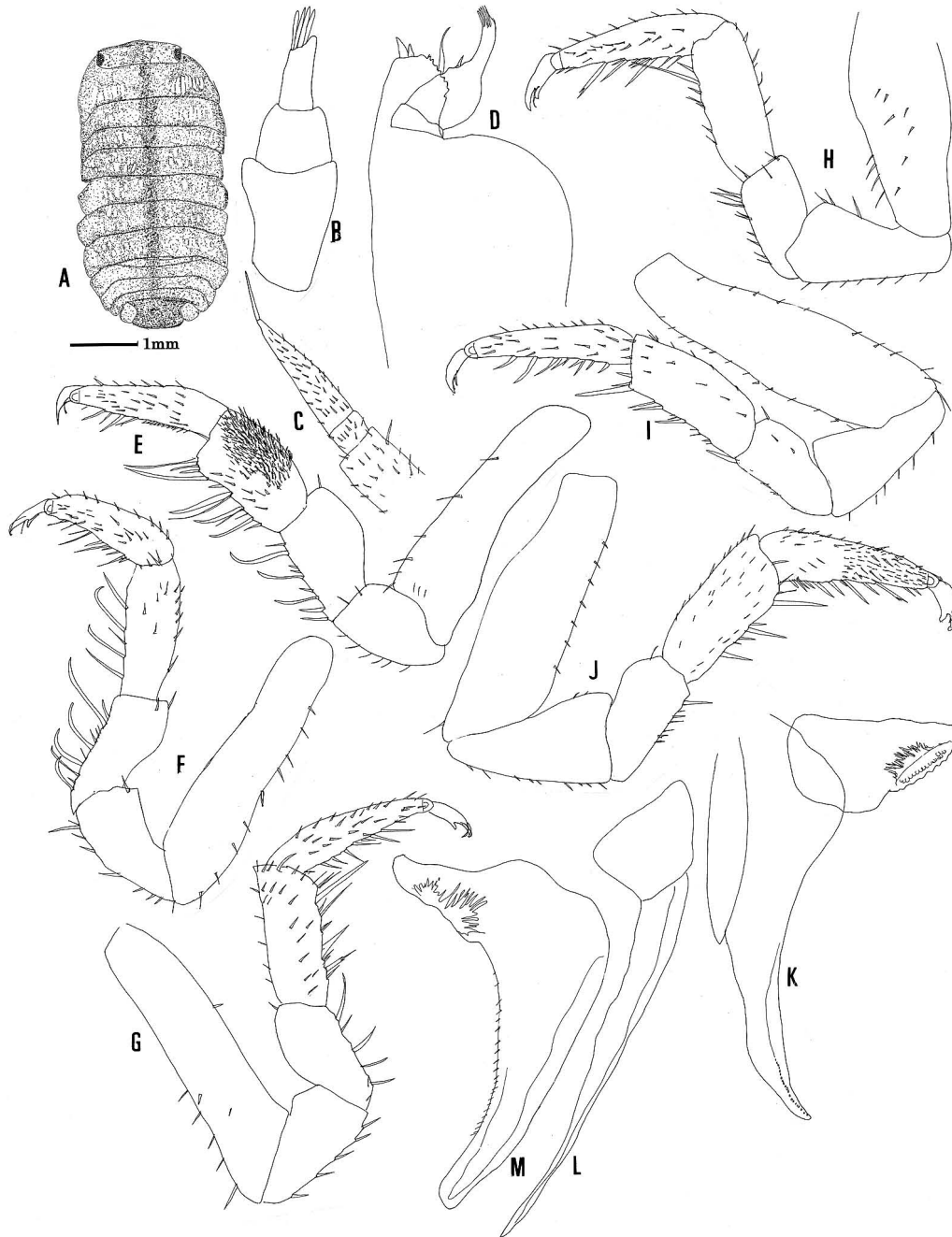


Fig. 10 *Spherillo pachysetifer* Nunomura, 2013

A, Dorsal view; B, Antennule; C, Tip of antenna; D, Maxilliped; E, Pereopod 1; F-J, Pereopods 3-7; K, Penes and male pleopod 1; L, Endopod of male pleopod 2; M, Exopod of the same (All: a male from Umaji-mura).

slight differences: (1) presence of serrated margin of endite of maxilliped (Fig. 10D), (2) less numerous setae on inner margin of pereopod 1 (Fig. 10E), (3) wider area of antenna grooming brushes (Fig. 10E), (4) less numerous aesthetascs of antennule, (Fig. 10C), (5) presence of bifurcated setae on inner side of pereopods, (Fig. 10E-J), (6) less denticles of outer margin of exopod on male first pleopod (Fig. 10K) and (7) smaller paler patterns of dorsal surface (Fig. 10A) (8) more denticles of outer margin of exopod on male second pleopod (Fig. 10L).

***Spherillo* sp.**

(Japanese name: Shikkoku-koshihiro-dangomushi)

Sphaeriillo dorsalis (Iwamoto, 1943); Nunomura, pp. 13-15, fig. 143. (*not dorsalis* Iwamoto, 1943).

Venzillo dorsalis (Iwamoto, 1943); Nunomura, 1998, p. 4.

Spherillo dorsalis (Iwamoto, 1943); Nunomura, 2006, p. 89.

Material examined: 2 ♀♀, Kankakei Valley, Shodo-shima, Kagawa Pref., coll. Minoru Shiba; 6 ♂♂ 7 ♀♀, Todorokinotaki, WF. 300m, Kainan-cho, Tokushima Pref., 28, Sep. 1999, Shuhei Nomura; 1 ♂ 9 ♀♀, Todoroki-no-taki, WF. 358m, Kainan-cho, Tokushima Pref., 28, Sep. 1999, Shuhei Nomura; 1 ♀, Tainohama, Tai, Minami-cho, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1 ♂ 1 ♀, Hiwasa-cho, Tokushima Pref., 28, June 1980, coll. Minoru Shiba; 1 ♀, Oosakagoe, Naruto-shi, Tokushima Pref., 4, Oct. 1981, coll. Shingo Tanaka; 1 ♂ 7y, Orono, Kamiyama-cho, Tokushima Pref., 4, Oct. 1981, coll. Shingo Tanaka; 1 ♀, Kawakami, Kijiya-son, Tokushima Pref., 4, Oct. 1981, coll. Shingo Tanaka; 2 ♂♂ 1 ♀, temple and shrine groves, Anan-shi, Summer, 1993, coll. Mari Abe; 4 ♂♂ 1 ♀, Mt. Tsukimiyama, 50m, Kagami-cho, Kochi Pref., 28, Sep. 1999, coll. Shuhei Nomura; 1 ♀, Hachigashiri, Nomi, Suzaki-shi, Kochi Pref., 29, May 2013, coll. Noboru Nunomura; 2 ♂♂ 11 ♀♀, Ohdairu-no-taki, Waterfall, 250m, Ochi-cho, Kochi Pref., 29, Sep. 1999, coll. Shuhei Nomura; 2 ♀♀, Tsukimiyama, Kagamicho, Kochi Pref., 28, Sep. 1999, coll. Shuhei Nomura; 7 ♂♂ 9 ♀♀, Cryptomeria-forest, Yanase-mura, Kochi Pref., coll. Hiroyuki Watanabe; 3 ♂♂ 5 ♀♀, Oodou-kaigan, Otsuki-cho, Kochi Pref., 12, Mar. 1978, coll. Yoshiaki Nishikawa; 2 ♂♂ 1 ♀, Sakugawa, Tosayamada-cho, Kochi pref., 8, Oct. 1990, coll. Shuhei Nomura.

Remarks: The present species was reported as “*Spherillo dorsalis* (Iwamoto, 1943)” in the previous paper (Nunomura, 2013) and other former papers and reports (Nunomura, 1987 and so on). But, recently Karasawa *et al* (2014) pointed out that Nunomura’s definition (1987) of “*Spherillo dorsalis*” is different from the original description of Iwamoto (1943), and the scientific name remains unknown, therefore, including all the specimens reported in the previous paper, the species name should be corrected.

***Spherillo russoi* (Arcangeli, 1927)**

(Japanese name: Tatejima-koshihiro-dangomushi)

Armadillo russoi Arcangeli, 1927, p. 218, fig. 3.

Material examined: 3 ♂♂ 6 ♀♀, Tsumajiro, Tosashimizu-shi, Kochi Pref., 28, May 2013, coll. Noboru Nunomura.

Porcellionidae

***Porcellionides pruinosus* (Brandt, 1833)**

(Japanese name: Hoso-warajimushi)

Porcellio pruinosus Brandt, 1833, p. 181.

Porcellionides pruinosus, Sars, 1898.

Material examined: 1 ♀, Akahana, Furue, Shodoshima-cho, Kagawa Pref., 24, May 2013, coll. Noboru Nunomura; 1 ♀, Onigasaki, Nishimura, Shodoshima-cho, Kagawa Pref. 24, May 2013, coll. Noboru Nunomura; 1 ♀, Ado-ike, Hiketa, Higashigawaga-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 1 ♀, on the bank of Gozafune-irie gawa, Minamichouwa-cho, Tokushima-shi, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1 ovig. ♀, Muroto-misaki, Muroto-shi, Kochi Pref., 26, May 2013, coll. Noboru Nunomura; 2 ♂♂ 1 ♀, Nishidomari, Otsuki-cho, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 5 exs, Katsurahama, Kochi-shi, Kochi Pref., 22, Nov. 1976, coll. Noboru Nunomura.

Family Armadillidiidae
***Armadillidium vulgare* (Latreille, 1804)**
(Japanese name: Oka-dangomushi)

Armadillo vulgaris, Latreille, 1804, p. 48.

Armadillidium vulgare (Latreille), Budde-Lund, 1885, p. 66.

Material examined: 1♂2♀♀, Akahana, Furue, Shdoshima-cho, Kagawa Pref., May 2013, coll. Noboru Nunomura; 2♀♀, Onigasaki, Nishimura, Shodoshima-cho, Kagawa Pref., May 2013, coll. Noboru Nunomura; 1♀, Ginpa-ura, Tonosho-cho, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 2♀♀, Ado-ike, Hiketa, Higashigawaga-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 1♂2♀♀, on the bank of Gozafune-irie gawa river, Minamishowa-cho, Tokushima-shi, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1♀, “White Beach” Shirahama, Toyo-cho, Kochi Pref., 19, May 2011, coll. Noboru Nunomura; 1♂, Murotomisaki, Muroto-shi, Kochi Pref., 19, May 2011, coll. Noboru Nunomura; 1♂, Usa, Tosa-shi, Kochi Pref., 26, May 2011, coll. Noboru Nunomura; 1♀, Usa, Tosa-shi, Kochi Pref., 29, May 2013, coll. Noboru Nunomura; 1♀, Uranouchi-higashibun, Nomi, Suzaki-shi, Kochi Pref., 29, May 2013, coll. Noboru Nunomura; 1♂1♀, Irinomatsubara, Kuroshio-cho, Kochi Pref., 18, May 2011, coll. Noboru Nunomura; 1ex, Itsukushima, Saga, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 1♂, Nishidomari, Otsuki-cho, Kochi Pref., 17, May 2011, coll. Noboru Nunomura; 2♂♂2♀♀, Nishidomari, Otsuki-cho, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 3exs, Cape Ashizuri, Tosashimizu-shi, Kochi Pref., coll. Noboru Nunomura; 3♀♀1y, Ooboake, Nishiiya-cho, Miyashi-cho, Kochi Pref., 19, Aug. 1990, coll. Noboru Nunomura; 4exs, Ikeda-cho, Kagawa Pref., 28, Apr., 1981, coll. Hisao Nambu; 3exs, Katsurahama, Kochi-shi, Kochi Pref., 22, Nov. 1976, coll. Noboru Nunomura; 11exs, Higashiba, Nangoku-shi, Kochi Pref., 3, Mar. 1976, coll. Noboru Nunomura; 1ex, Cape Ashizuri, Tosashimizu-shi, Kochi Pref., 20, Aug. 1990, coll. Noboru Nunomura; 1ex, Nanzan, Takase-cho, Kagawa Pref., 15, May 2001, coll. Keisuke Nishikawa; 6exs, Yasu, Kochi-shi, Kochi Pref., 23, July 1976, coll. Yoshiaki Nishikawa; 3♀♀, Ooharamachi, Niiya-son, Miyoshi-cho, Tokushima Pref., Aug. 1999, coll. Noboru Nunomura; 1♀, Segawa Tokushima-shi, Tokushima Pref., coll. Noboru Nunomura.

Family Tylidae
***Tylos granuriferus* Budde-Lund, 1885**
(Japanese name: Hama-dangomushi)

Tylos granulatus (nec Krauss, 1843), Miers, 1877, p. 674, pl. 69, fig. 2.

Material examined: 1ex, Shido-cho, Kagawa Pref., Aug. 1975, coll. Shin'ichiro Fuse; 2♂♂2♀♀, Kashimagaura, Saga, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 1♀, Oomiko-kaigan, Oohara, Tokushima-shi, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura.

Suborder Asellota
Family Asellidae
***Asellus (Asellus) hilgendorfi hilgendorfi* Bovallius, 1886**
(Japanese name: Mizumushi)

Asellus hilgendorfi Bovallius, 1886, p. 13.

Material examined: 2♂♂, Myoken, Nangoku-shi, Kochi Pref., 27, May 2013, coll. Noboru Nunomura.

***Asellus (Asellus) hilgendorfi tokushimaensis* n.ssp.**
(Japanese name: Tokushima-ido-mizumushi, new)
(Figs.11-12)

Material examined: 11♂♂ (1♂ holotype, 6.0mm in body length and 10♂♂ paratypes, 4.0-6.6 mm in body length) and 2♀♀ (1♀ allotype, 4.5mm in body length and 1♀ paratype, and 4.0mm in body length), Dug well at Kitahara, Kamikirai, Ichiba-cho, Awa-shi Tokushima Pref., 28, Jan. 1999, coll. Shun-Ichi Uéno, Masataka

Yoshida and Haruo Bando. Type series is deposited as follows: Holotype (NSMT-Cr 22814), allotype (NSMT-Cr 22815), 5 paratypes (NSMT-Cr 22816) at National Museum of Nature and Science, Tokyo, 6 paratypes (TOYA Cr-23602-3606, 23013) at Toyama Science Museum.

Description: Male. Body (Fig.11 A) 3.7-3.8 times as long as wide. Color white. Surface smooth. Anterior margin of cephalon slightly concave. Cephalon with weak projections on lateral border. Eyes small, each eye composed of 5-6 ommatidia. Pleonal somite with 2 short distinct segments. Pleotelson 0.8 times as long as wide.

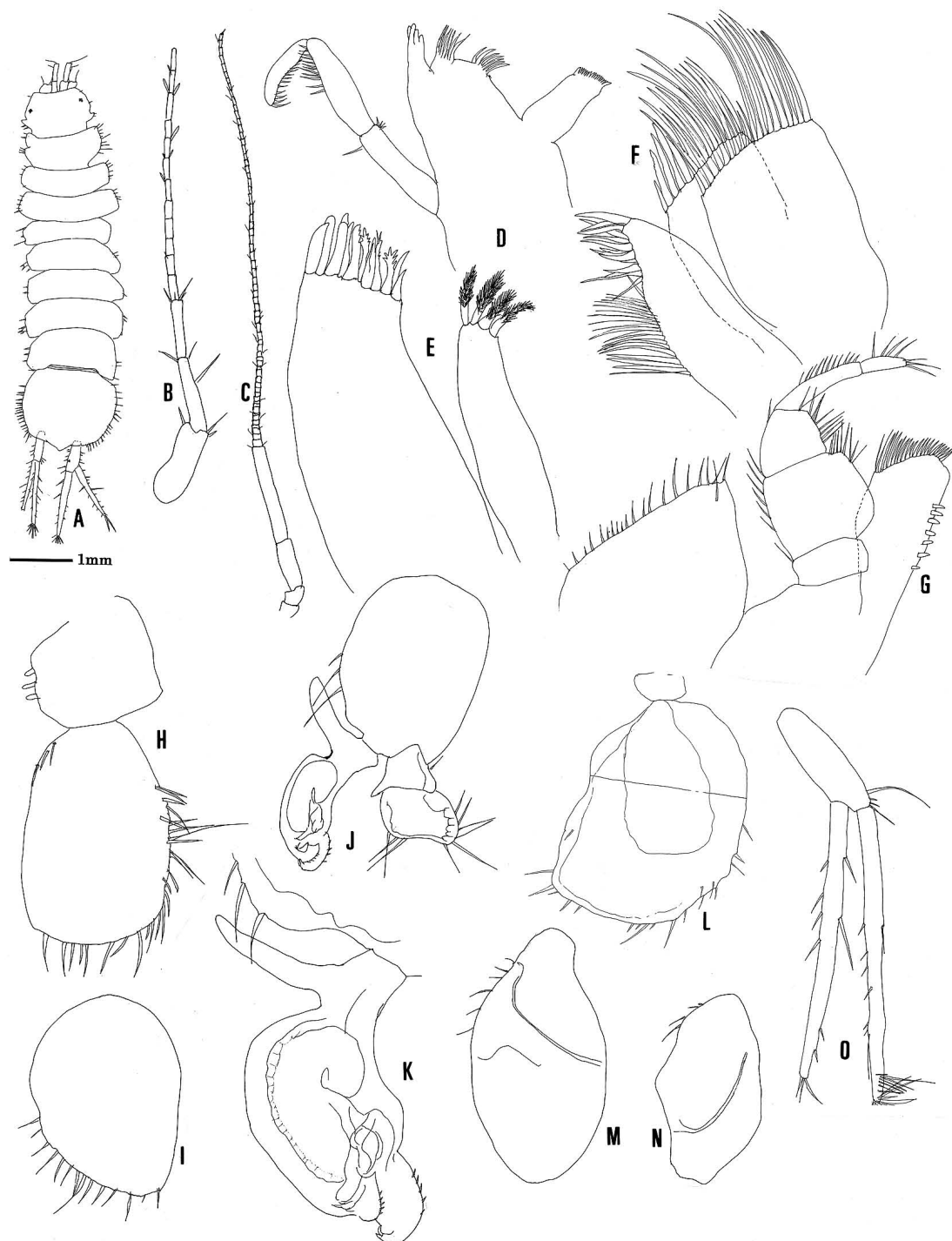


Fig. 11 *Asellus (Asellus) hilgendorfi tokushimaensis* n.ssp.

A, Dorsal view; B, Antennule; C Antenna; D, Mandible; E, Maxillula; F, Maxilla; G, Maxilliped; H, Male pleopod 1; I, Female pleopod 1; J, Male pleopod 2; K, Endopod of the same; L-N, Pleopods 3-5; O, Uropod (A-H. L-O: holotype male, I, female allotype).

Antennule (Fig. 11B) composed of with 3 peduncular segments and 12 flagellar segments.

Antenna (Fig. 11C) long, reaching the posterior end of fifth pereonal somite, with 5 peduncular segments and 59-75 flagellar segments.

Mandible (Fig. 11D): pars incisiva 4-headed; lacinia mobilis with 7-8 spines; processus molaris long; palpal segment 1 with a seta; palpal segment 2 with 10 setae, segment 3 with 10 setae. Maxillula (Fig. 11E): mesial endite with 4 plumose setae; lateral endite with 12-13 teeth including 5 serrated ones. Maxilla (Fig. 11F): mesial lobe with 35-40 setae; middle lobe with 15-17 setae; lateral lobe with 20-21 teeth. Maxilliped (Fig. 11G): endite with 5-7 coupling hooks on lateral border, palp five-segmented; segments 2-3 stout and segments 4-5 narrow; segment 4 slender, 1.7 times as long as segment 3; segment 5 slender half-length of segment 5.

Pereopod 1 (Fig. 12A) subchelate: basis 2.6 times as long as wide, with 3-6 setae on outer margin; ischium 0.6 times as long as basis, with 2-3 setae on both margins; merus half-length as long as ischium, with 4-5 setae on inner margin and a long seta at outer distal angle; carpus triangular, with 6-8 setae on inner margin; propodus stout, with a very low projection on basal area of inner margin, inner margin with many setae;

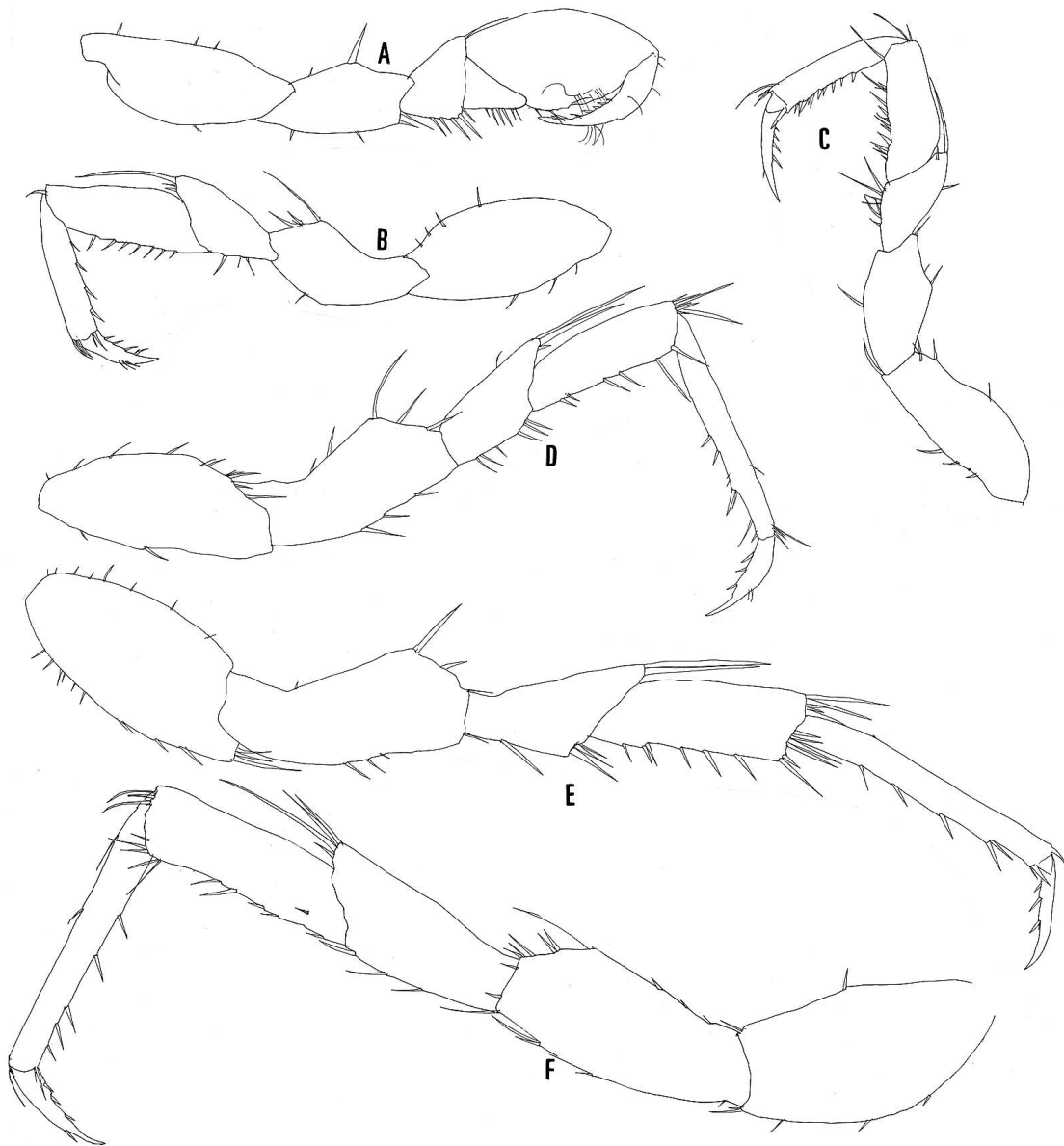


Fig. 12 *Asellus (Asellus) hilgendorfi tokushimaensis* n.ssp.

A-B. Pereopods 1-2; C-F, Pereopods 4-7. (All: holotype male).

dactylus long and reaches the basal end of propodus, with 6-7 setae on inner margin.

Pereopod 2 (Fig. 12B): basis 2.1 times as long as wide, with 4-5 setae on both margins; ischium a little shorter than basis, with 3 setae including a long one on outer margin; merus 0.7 times as long as ischium, with 3-4 setae at sternal margin and 3 setae including a long one on outer margin; carpus, 1.8 times longer than merus, with 7 setae on inner margin and a few of setae including a long one at outer distal area; propodus as long as carpus, with 4 setae on inner margin and a group of 3-4 setae at outer distal angle; dactylus half-length of propodus, with 4 setae on inner margin and 3 setae on outer area.

Pereopod 3 similar to the preceding ones: basis with 8 setae on both margins; ischium with 8 setae on inner margin and 3 setae on outer margin; merus 5-6 setae on distal half of inner margin, 3 setae at outer distal margin; carpus 11-12 setae on inner margins.

Pereopod 4 (Fig. 12C) a little shorter than the pereopod 2: basis 2.1 times as long as wide, with 3 setae at inner distal area; ischium two-thirds as long as basis; merus two-thirds as long as ischium, with 7-8 setae on inner margin and a long seta at outer distal angle; carpus 1.6 times longer than merus, with 10-12 setae on inner margin; propodus as long as carpus, with 10 setae on inner margin and 3 relatively long setae on distal margin; dactylus two-thirds as long as propodus, with 4 setae on inner margin.

Pereopod 5 (Fig. 12D) longer than the preceding 4 pairs: basis 2.3 times as long as wide, with 8-10 setae on outer margin; ischium 0.85 times as long as basis, with 3 setae on inner margin and 5-6 relatively long setae on outer margin; merus 0.6 times as long as ischium, with 6 setae on inner margin and 3 long setae at outer distal angle; carpus 1.5 times longer than merus, with 6-7 setae on inner margin and 6-7 setae on outer distal area; propodus 1.3 times longer than merus, with 6 inner margin; dactylus 0.45 times as long as propodus, with 3 setae on inner margin.

Pereopod 6 (Fig. 12E) a little longer than the fifth: basis with 8-10 setae on both margins and 3 setae at inner distal angle; ischium almost as long as basis, with 3-4 setae on both margins; merus half-length of ischium, with 3-4 setae on inner margin, 2 long setae at outer distal area; carpus 1.2 times as long as merus, with 7-8 setae on inner margin and 10-12 setae around the distal margin; propodus 1.5 times longer than carpus, with 6-7 setae on inner margins; dactylus 0.4 times as long as propodus, with 3 setae on inner margin.

Pereopod 7 (Fig. 12F) a little longer than the pereopod 6: basis 1.9 times as long as wide, with 7 setae on inner margin, and 2-3 setae on outer margin and 3 setae at inner distal angle; ischium rectangular, 2.3 times as long as wide, with 5 setae on inner margin and 6-8 setae on outer margin; merus a little shorter than ischium, with 5-6 setae on inner margin and 3-4 long setae at outer distal angle; carpus as long as merus, with 4-5 setae on inner margin, and 10-12 relatively long setae on distal margin; propodus 1.6 times as long as carpus, with 5-8 setae on inner margin and 3-6 setae on outer margin; dactylus with 3 setae on inner margin.

Pleopod 1 (Fig. 11H): peduncle ovoid, with 3 hook-like protuberances on inner margin; terminal segment rounded rectangular, with about 30 setae around the margin and 3-5 short setae on basal part of inner margin.

Pleopod 2 (Fig. 11J and K): peduncle a little longer than wide, with 2-3 setae on inner margin; endopod with long and round basal apophyse extending toward the inner margin of peduncle, long caudal process bearing 4 spinules laterally and 2 spinules at the tip; cannula stout, with 5 spinules on lateral margin and much reduced lateral process; exopod 2-segmented; basal segment trapezoid, distal segment wider than long, with 9 setae around the margin.

Pleopod 3 (Fig. 11L): exopod rectangular with a suture line, with some relatively short setae around the margin.

Pleopods 4-5 (Fig. 11M-N): exopod rectangular with 4-6 setae.

Uropod (Fig. 11O): peduncle rectangular, 5.5 times as long as wide; exopod 2.3 times longer than peduncle, endopod a little shorter than exopod.

Female: Pleopod 1 (Fig. 11 I) semicircular.

Etymology: The new subspecies name comes from "Tokushima Prefecture", where this present new subspecies was collected.

Remarks: The present specimens agree with description of *Asellus hilgendorfi* in shape but, hitherto 7 sub-species of this species have been recorded as valid (Sidrov, 2005). Among these, the present specimens most closely allied to *Asellus hilgendorfi ryukyuensis* (Uéno, 1938) in shape and lacking of projection of inner side of propodus pereopod 1, but the former is separated from the latter in the following features: (1) longer dactylus of pereopods, (2) longer setae at outer distal area of merus of pereopods, (3) less numerous setae on maxilliped, (4) smaller and perhaps numerous ommatidia of eyes, (5) numerous setae of antennule, (6) numerous setae of antenna, (7) longer endopod of male second pleopod and (8) narrower protopod of the same.

The present specimens is different from *Asellus hilgendorfi hilgendorfi*, but the former is separated from the latter in the following features: (1) paler body color, (2) weaker strongly convex upper border of propodus of male pereopod, (3) weaker lateral projection of cephalon, (4) less numerous setae on eyes, (5) longer setae at outer distal area of merus of pereopods and (6) shorter setae around the margins of pleopods.

***Phreatoasellus awaensis* n.sp.**

(Japanese name: Awa-naga-mizumushi, new)

(Figs.13-14)

Material examined: 11♂♂ (1♂ holotype, 7.7mm in body length and 10♂♂ paratypes, 7.2-8.7 mm in body length) and 2♀♀ (1♀, allotype, 8.3mm in body length and 1♀ paratype, 7.1 mm in body length). Dug well at Kitahara, Kamikirai, Ichiba-cho, Awa-shi, Tokushima Pref., 28, Jan. 1999, coll. Shun-Ichi Uéno, Masutaka Yoshida and Haruo Bandô.

Type series is deposited as follows: Holotype (NSMT-Cr 22817), allotype (NSMT-Cr 22818) and 5 paratypes (NSMT-Cr 22819) at National Museum of Nature and Science, Tokyo and 6 paratypes (TOYA Cr-23607-23612) at Toyama Science Museum.

Description of male. Body (Fig 13A) slender and width uniform, about 5.5-6.2 times as long as wide excluding both antennae and uropod. Color white in alcohol. Surface smooth. Cephalon almost as long as wide, with weak projection on lateral margin. Eyes lacking. Pereonal somites subequal. Pleotelson 1.8 times as long as wide.

Antennule (Fig.14B), reaching the middle area of cephalon, composed of 3 peduncular segments and 13 flagellar segments; many of the flagellar segments with 1-2 aesthetascs. Antenna (Fig. 14C), reaching almost the posterior end of sixth pereonal somite, with 5 peduncular segments and about 65-70 flagellar segments. Left mandible (Fig. 13D) :pars incisiva 4-toothed; lacinia mobilis 3-toothed; 11-13 serrated setae; palp three-segmented; segment 2 as long as segment 1 with 8-10 setae on distal half; terminal segment with more than 13 short setae on inner margin. Maxillula (Fig 13E-F): mesial endite with 5 plumose segments, two of them shorter than the others; lateral endopod with 14 teeth at the tip, seven of them serrate and only outer most one thin. Maxilla (Fig. 13G): mesial endopod each middle and lateral ramus of exopod with about 26 setae; endopod with about 30 setae. Maxilliped (Fig.13H): endite with 7 coupling hooks; palp five-segmented, second segment big, with many setae on inner margin; third segment square with 8-9 setae on inner margin; terminal two segments slender.

Pereopod 1 (Fig. 14A): basis about twice as long as wide; ischium two-thirds as long as basis, with 2-3 setae on both margins; merus trapezoid, with 2 setae on inner margin and 2 setae at outer distal angle; carpus short and triangular; propodus about 3 times as long as wide, with 7-8 setae on inner margin and 3 setae at outer distal angle; dactylus long with 6 setae on inner margin and 4 setae on distal outer margin.

Pereopod 2 (Fig. 14B): basis 3 times as long as wide, with 3 short setae on inner margin; ischium 2.7 times as long as wide; merus 55 % as long as basis, with 2 setae on inner margin and a long seta at outer distal angle; carpus 1.9 times as long as wide, with 5 short setae on inner margin and 4-5 setae on outer margin; propodus as long as propodus, with 3 setae on inner margin and 8-10 setae on outer margin; dactylus one-third as long as propodus.

Pereopod 3 (Fig. 14C): basis 2.3 times as long as wide; ischium with 2-4 setae on outer margin; merus 0.6 times as long as ischium, with 4 setae on inner margin and 2-4 setae on outer distal area; carpus 3 times as

long as merus, with 7-8 setae on inner margin, 3-4 setae on outer margin and about 5-6 setae at outer distal angle; propodus as long as carpus, with 4-5 setae on inner margin and 6 setae on outer margin; dactylus one-third long as propodus.

Pereopod 4 (Fig.14D) a little longer than pereopod 3: basis 2.7 times as long as wide; ischium fusiform and 0.7 times as long as basis, with 3-4 setae on inner margin and 4-5 setae on outer margin; merus triangular and two-thirds as long as ischium, with 4-5 setae on inner margin and 3 long setae at outer distal angle; carpus 1.8 times as long as merus, with 5-6 setae on inner margin and 2-3 setae at outer distal angle; propodus 1.2 times as long as carpus, with 7-8 setae on inner margin and 6-10 setae on outer margin; dactylus one-third long as propodus.



Fig. 13 *Phreatoasellus awaensis* n.sp.

A, Dorsal view; B, Antennule; C, Antenna; D, Mandible; E, Mesial lobe of maxillula; F, Lateral lobe of the same; G, Maxilla; H, Maxilliped; I, Male pleopod 1; J, Female pleopod 1; K, Male pleopod 2; L-N Pleopods 3-5; O, Uropod (A-H. L-O: male, I, female allotype).

Pereopod 5 (Fig. 14E) longer than the four preceding pairs: basis twice as long as wide; ischium 0.8 times as long as basis, with 4-7 setae on outer margin; merus twice as long as wide, with 5-7 setae on inner margin; carpus 3.7 times as long as wide, with about 9-13 setae on inner margin and 3-4 setae at outer distal angle; propodus long, one-fourth as long as wide, with 8-15 setae on inner margin a spur at inner distal angle and 6 setae on outer margin; dactylus one-third as long as propodus.

Pereopod 6 (Fig. 14F): basis with 3-4 setae on inner margin and 6-7 setae on outer margin; ischium with 3-5 setae on inner margin and 4 setae on outer margin; merus three-fourths as long as ischium, with 5-6 setae on inner margin and 1-3 setae at outer distal angle; carpus rectangular, three-fourths as long as merus, with 8-11 setae on inner margin ; propodus long 1.3 times as long as carpus, with 9-10 setae on inner margin, 7-8 setae on outer margin and a spine on distal margin; dactylus one-fourth as long as propodus.

Pereopod 7 (Fig. 14G): basis with a short seta near the distal end of both sides; ischium with 2-3 setae on inner margin; merus as long as ischium, with a short seta at outer distal angle; carpus 1.6 times as long as wide, with 6-7 setae on inner margin and 2-4 setae on outer margin; propodus a little longer than carpus, with 8-11 setae on inner margin and 7-9 setae on outer margins; dactylus one-fifth as long as propodus.

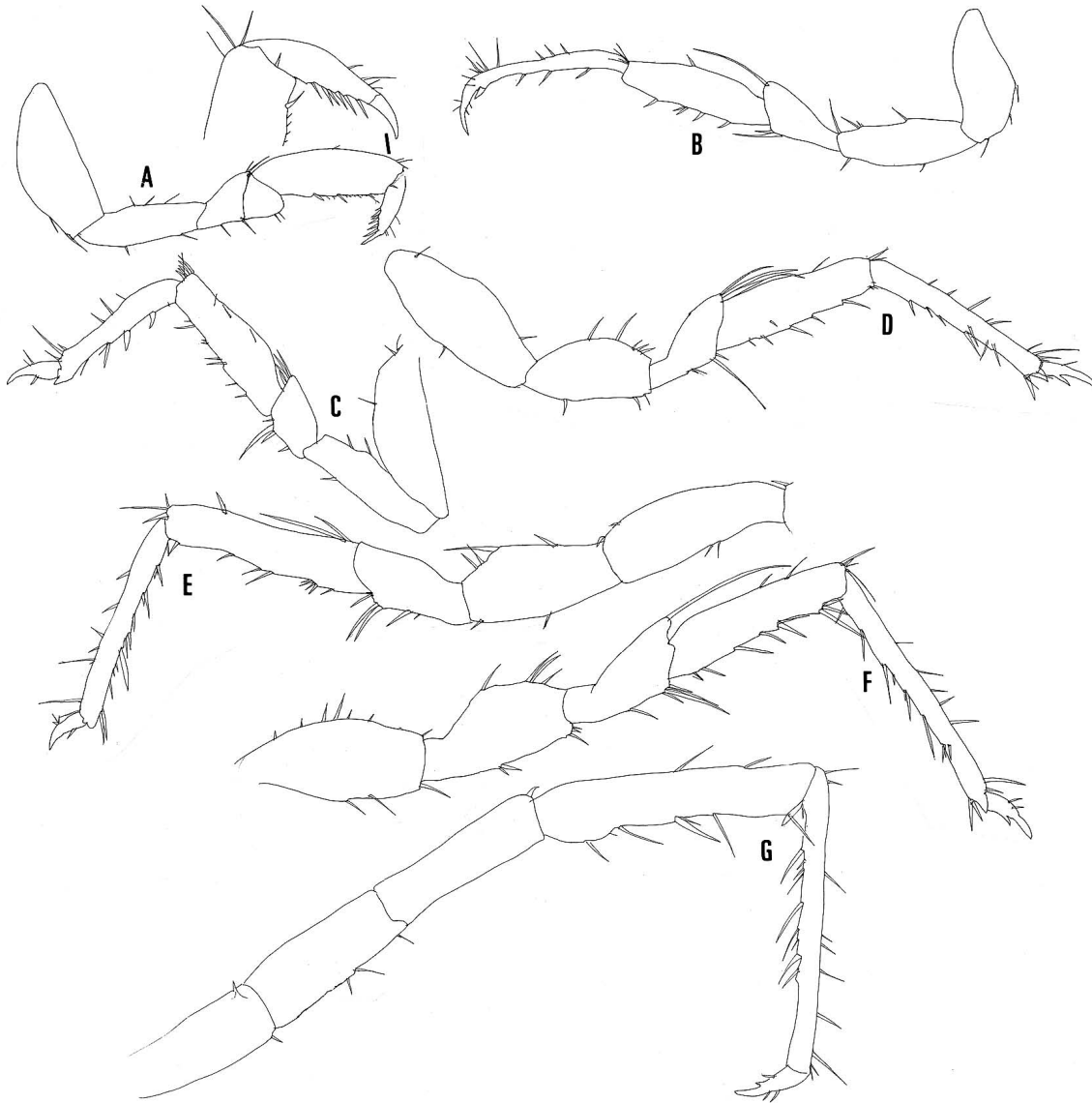


Fig. 14 *Phreatosellus awaensis* n.sp.
A-G, Pereopods 1-7 (All: holotype male).

Pleopod 1 (Fig. 13I): peduncle longer than wide, inner border with 2 hook-like protuberances; exopod ovoid, with many setae around the margin.

Pleopod 2 (Fig. 13K): peduncle rectangular, a little longer than wide; endopod rectangular, 2.1 times as long as wide, with horn-shaped basal apophyse extending toward the inner margin of peduncle; exopod 2-segmented, basal segment pentagonal, with 17-18 setae around the margin.

Pleopod 3 (Fig. 13L): endopod small and ovate; exopod rectangular, 1.9 times as long as wide, with a transverse suture line.

Pleopod 4 (Fig. 13M): both rami elongated.

Pleopod 5 (Fig. 13N): both rami elongated, but shorter than pleopod 4.

Uropod (Fig. 13O) long and occupied about one-third of the whole body and twice as long as pleotelson; peduncle occupies 60% of total length of uropod, with 8 setae on inner margin and 6 setae on outer margin; endopod three-fifths as long as peduncle, with 3 setae on both margins and a tuft of 5-6 setae at the tip; exopod a little shorter than endpod.

Female: Body 5.8 times as long as wide. Pleopod 1 semicircular. Pleopod 2 lanceolate.

Etymology: Species name “Awa” is the old provincial name of Tokushima Prefecture where the present new species was collected.

Remarks: Hitherto eight species of the Genus *Phreatoasellus* have been recorded from Japan (Chappuis, 1955; Matsumoto, 1960, 1962, 1978). The present new species is most closely allied to *Phreatoasellus minatoi* reported from Ayukawa, Wakayama Prefecture, but the former is separated from the latter in the following features: (1) shorter dactylus of male first pereopod, (2) more flagellum of antennule, (3) more flagellum of antenna and (4) more denticles of dactylus of male first pereopod.

The present new species is also allied to *Phreatoasellus yoshinoensis* Matsumoto, 1960 reported from Yamakawa, Tokushima Prefecture, but the former is separated from the latter in the following features: (1) less numerous setae of male first pleopod, (2) more numerous setae on all the lobes of maxilla, (3) more flagellum of antennule, (4) numerous setae on middle lobe and lateral lobe and (5) bigger body.

The present new species is also allied to *Phreatoasellus miurai* Matsumoto, 1955 reported from Aioi, Hyogo Prefecture, but the former is separated from the latter in the following features: (1) longer propodus, (2) longer uropod, (3) less numerous spinules of male first pereopod, (4) more flagellum of antennule and (5) more flagellum of antenna.

***Nipponasellus* sp. (aff. *hubrichti* Matsumoto, 1956)**

(Fig.15)

Material examined. 1 ♀ (5.3 mm in body length), Dug well at Kitabara, Kamikirai, Ichiba-cho, Tokushima Pref., 28, January, 1999. coll. Shun-Ichi Uéno, Masataka Yoshida and Haruo Bando. This specimen is deposited at National Museum of Nature and Science, Tokyo (NSMT-Cr 22820).

Description: Body (Fig. 15A) 3.6 times as long as wide. Surface smooth. Cephalon round, without protrusion on lateral margin. Eye lacking. All the pereonal somites parallel and similar in length. Pleotelson round, almost equally as long as wide.

Antennule (Fig. 15B) with 2 peduncular segments and 4 flagellar segments. Antenna (Fig. 15C), reaching the pereonal somites, with 5 peduncular segments and 28 flagellar segments.

Mandible (Fig. 15D): pars incisiva 3-toothed; lacinia mobilis 3-toothed; 4 separated setae; processus molaris missing; palp single-segmented. Maxillula (Fig. 15E): mesial lobe with 5 plumose setae on distal margin; lateral endite with 13-14 teeth on apical margin, four of which serrated. Maxilla (Fig. 15F) mesial endite with 8 setae; middle ramus of outer lobe with 12 setae and 6 setae on lateral lobe of the same. Maxilliped (Fig. 15G): endite, with 4 coupling hooks on lateral border and 17-18 setae on distal margin; palpal segment 1 rectangular, with a seta; segment 2 biggest, with 8-9 setae on inner margin and 2 setae on outer margin; segment 3 round; segments 4 and 5 narrower than the basal three segments; epipodite narrow.

Pereopod 1 (Fig 15H): basis rectangular, 3 times as long as wide, with 2 setae on inner margin and a seta on outer margin; ischium 0.55 times as long as wide; merus pentagonal, two-thirds as long as wide, with 2 setae on inner margin and 2 setae on outer distal angle; carpus half-length of merus and square; propodus three-fourths as long as basis, with 11-12 setae on inner margin; dactylus with 3 setae on inner margin and 4 relatively long setae on inner margin.

Pereopod 2 (Fig 15I): basis 3.6 times as long as wide; ischium 0.55 times as long as basis; merus two-thirds as long as ischium; carpus trapezoid; propodus 0.7 times as long as basis; dactylus with 4-5 setae on inner margin and 4 setae on outer margin.

Pereopods 3-5 (Fig 15J) almost similar in shape: basis 3.7 times as long as wide; ischium 55% as long as basis; merus a little shorter than ischium; carpus three-fourths as long as basis; propodus a little longer than carpus; dactylus without seta.

Pereopod 6 (Fig. 15K): basis 2.0 times as long as wide, with 3 setae on outer margin; ischium rectangular, 0.6 times as long as basis, with 3 setae on inner margin; merus triangular, with 3 setae on inner margin and

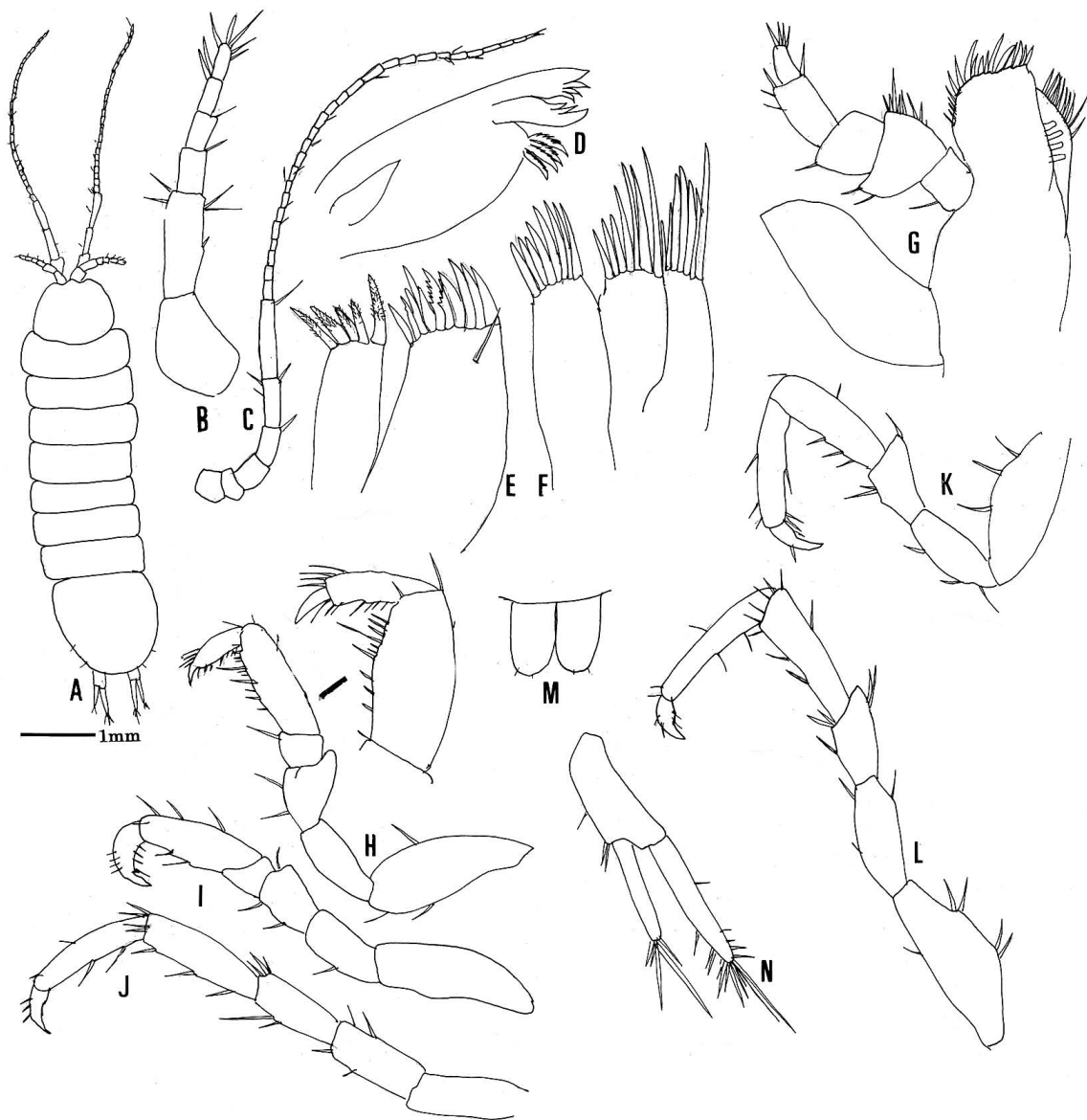


Fig. 15 *Nipponasellus* sp. (aff. *hubrichiti* Matsumoto, 1956)

A, Dorsal view; B, Antennule; C Antenna; D, Mandible; E, Maxillula; F, Maxilla; G, Maxilliped; H-J, Pereopods 1-3; K-L, Pereopod 6-7; M, Pleopod 1; N, Uropod. (All: female from Tokushima).

a seta at outer distal angle; carpus rectangular, 1.6 times longer than merus, with 2-3 setae on inner margin and 3 setae on outer margin; propodus as long as carpus, with 3 setae on both margins.

Pereopod 7 (Fig. 15L): basis rectangular, 3.5 times as long as wide, with a seta on inner margin and 2 groups of 2 setae on outer margin; ischium 0.6 times as long as basis, with 2 setae on inner margin and a seta on outer margin; merus 0.7 times as long as ischium, with 3 setae on inner margin and 2 relatively longer setae at outer distal angle; carpus twice as long as merus, with 3-4 setae on inner margin and 3 setae on outer margin; propodus almost as long as carpus, with 2-3 setae on inner margin and 2-3 setae on outer margin.

Pleopod 1 (Fig. 15M) semicircular.

Uropod (Fig. 15N) short: peduncle 2.5 times as long as wide, endopod as long as basis and exopod three-fourths as long as endopod.

Remarks: Hitherto five species of the genus *Nipponasellus* have been reported from ground-water of various parts of Japan. This specimen is most closely allied to *N. hubrichti* reported from Hachioji, Tokyo and their neighboring area but it differs from the later in the following features : (1) shorter body, (2) longer carpus of all pereopods, shorter dactylus of pereopods, (3) round female pleopod 1 and (4) numerous teeth of maxillula. Unfortunately only one female was at my disposal, therefore I refrained to establish a new species.

Family Janiridae

Ianiropsis longiantennata (Thielemann, 1910)

(Japanese name: Umimizumushi)

Ianiropsis longiantennata Thielemann, 1910, p. 70, figs. 76-81 (Japan).

Material examined: 1 ex, Mekusare, Tatsukushi, Tosa-shmizu-shi, Kochi Pref., 17, May 2003, coll. The Biological Institute on Kuroshio (BIK) ; 1 ex, Sakaide-shi, Kagawa Pref., Feb. 1975, coll. Shin'ichiro Fuse; 2♀♀, Akahana, Furue, Shodoshima-cho, Kagawa Pref. May 2013, coll. Noboru Nunomura; 1♀, Murou, Shodoshima-cho, Kagawa Pref., May 2013, coll. Noboru Nunomura; 1♀, Nakayoshima, Tonosho-cho, Kagawa Pref., May 2013, coll. Noboru Nunomura; 1♀, Ado-ike, Hiketa, Higashigkawaga-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 1♀, Mitsu, Naruto-shi, Tokushima Pref., 25, May 2013, coll. Noboru Nunomura; 1♀, Okazaki-kaigan, Naruto-shi, Tokushima Pref., 14, May 1998, coll. Noboru Nunomura.

Family Jaeropsidae

Jaeropsis lobata Richardson, 1899

(Japanese name: Hirata-umimizumushi)

Jaeropsis lobata Richardson, 1899p. 859 (Monterey Bay).

Material examined: 2♂♂1♀, Nada, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 1♂2♀♀, Tsumajiro, Tosashimizu-shi, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 1♀, Tatsukushi, 7, May 2003, coll. The Biological Institute on Kuroshio (BIK); 2♂♂6♀♀, Shiuranohama, Nishidoamari, Outsuki-cho, Kochi Pref., 4, June 2012, coll. Noboru Nunomura.

Suborder Cymothoida

Family Cirolanidae

Cirolana harfordi japonica Thielemann, 1910

(Japanese name: Nise-sunahorimushi)

Cirolana harfordi japonica Thielemann, 1910, p. 11, figs. 5-7 (Fukuura & Ito, Sagamibai; Pulo Pinang).

Material examined: 4♀♀ 1y, Kosaitsumo, Otsuki-cho, Kochi Pref., 5, June 2012, coll. Noboru Nunomura; 1♂ 20♀♀, Shiuranohama, Ootusuki-cho, Kochi Pref., 17, May 2011, coll. Noboru Nunomura and Shu Nakachi.

***Exciorolana chiltoni* (Richardson, 1905)**

(Japanese name: Hime-sunahorimushi)

Cirolana chiltoni Richardson, 1905, p. 91, fig. 73 (San Francisco, California).

Cirolana chiltoni japonica, Thielemann, 1910, p. 15, figs. 8-11 (Todohokke, Hokkaido).

Exciorolana chiltoni (Richardson, 1905) p. 201.

Material examined: 1♀, Enohana, Aji-cho, Takamatsu-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 1ex, Enohana, Aji-cho, Kagawa Pref., coll. Shin' ichiro Fuse *et.al.*; 2♂♂1♀, Kitasuoki, Tokushima-shi, Tokushima Pref., 23, Oct. 1999, coll. Katsushi Sakai; 1♀, Kan'noura, Toyo-cho, Kochi Pref., 19, May 2011, coll. Noboru Nunomura; 1ex., Furue, Mugi, Tokushima Pref., 1, Mar. 1973, coll. Noboru Nunomura.

***Eurydice akiyamai* Nunomura, 1981**

(Japanese name: Higata-sunahorimuhsi)

(Fig.16)

Eurydice akiyamai Nunomura, 1981, pp.7-10, fig.1-2 (Ichinomiya, Chiba).

Eurydice akiyamai Nunomura and Nunokawa 2009; pp.89-93, figs.2-4 (Nago, Okinawa).

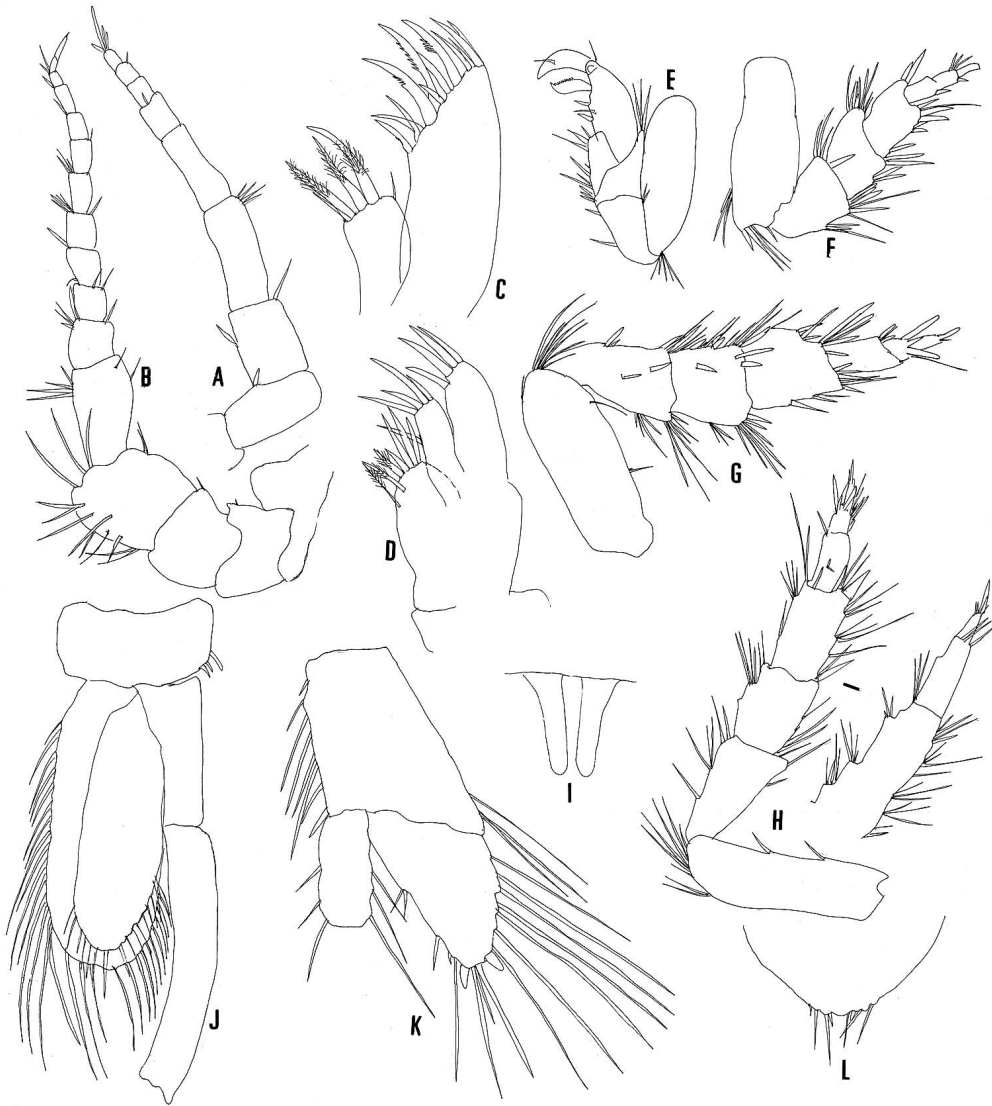


Fig. 16 *Eurydice akiyamai* Nunomura, 1981

A, Antennule; B, Antenna; C, Maxillula; D, Maxilla; E, Pereopod 1; F, Pereopod 3; G-H, Pereopods 6-7; I, Penes; J, Male pleopod 2; K, Uropod (All :male from Tokushima).

Material examined: 1♂ (4.3mm in body length) and 1♀ (5.5mm in body length), Kitaokisu, Tokushima-shi, Tokushima Pref., Oct. 1999, coll. Katsushi Sakai.

Remarks: The specimens from Tokushima agree with the original description (Nunomura, 1981), but the present specimens show the following differences: (1) longer antennae (Fig. 16A,B), (2) presence of bigger serrated setae on pereopods 1, 6, (Fig. 16E-H), (3) longer plumose setae on mesial lobe of maxillula (Fig. 16C), (4) longer setae on maxilla (Fig. 16D), (5) shallower concavity of endopod of male second pleopod (Fig. 16F) and (6) shallower concavity of posterior margin of pleotelson (Fig. 16L).

The present specimens differ from the those from Okinawa (Nunomura and Nunokawa, 2009), in the following features : (1) longer penes (Fig. 16I) and (2) wider and shallower concavity of tip of male second pleopod. (Fig. 16L)

***Metacirolana costata* Nunomura, 1999**

(Japanese name: Ryūkotsu-sunahorimushi-modoki)

Metacirolana costata Nunomura, 1999. pp14-16. Fig.4.

Material examined: 1♂1♀, Kosaitsumo, Otsuki-cho, Kochi Pref., 6, June 2012, coll. Noboru Nunomura; 3♂♂ 5♀♀, Shiuranohama, Nishidomari, Otsuki-cho, Kochi Pref., 4, June, 2012, coll. Noboru Nunomura and Shu Nakachi; 1♂1♀, Shiuranohama, Otsuki-cho, Kochi Pref., 7, May 2011, coll. Noboru Nunomura; 8♀♀, Nada, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 3♀♀, Tsumajiro, Tosashimizu-shi, Kochi Pref., 28, May 2013, coll. Noboru Nunomura.

***Natatolana japonensis* (Richardson, 1904)**

(Japanese name: Yamato-suhahorimushi)

Cirolana japonensis Richardson, 1904, p. 35, figs. 3-5 (Yokkaichi).

Natatolana japonensis, Bruce, 1981, p. 958.

Material examined: 1♀, Nishiwaki, Sakaide-shi, Kagawa Pref., Feb. 1976, coll. Shin'ichiro Fuse *et al.*

Family Cymothoidae

***Mothocya* sp. (aff. *parvostis* Bruce, 1986)**

(Fig.17)

Material examined: 1♀ (12.0 mm in body length), off Tachibana Bay, Anan-shi, Tokushima Pref., 19, June 1995, coll. Yukio Ueta. This specimen is deposited at Toyama Science Museum (TOYA Cr- 23572).

Description: Body (Fig 17A): ellipsoid, 2.6 times as long as wide. Color pale yellow. Anterior margin of cephalon round. Posterior margin of pleotelson round.

Antennule (Fig 17B), with 3 peduncular segments and 5 flagellar segments. Each segment with a tuft of setae spread toward the distal end and each distal segment with a group of aesthetascs. Antenna (Fig. 17C) with 5 peduncular segments and 11-12 flagellar segments.

Mandible (Fig 17D): pars incisiva with 3 teeth; palp three-segmented; second segment with 6 setae on distal area: segment 3 longer, with 22-23 setae on inner margin. Maxillula (Fig. 17E): mesial endite with 3 teeth on apical area. Maxilla (Fig. 17F) with 4 teeth. Maxilliped (Fig. 17G): terminal segment, with 4 recurved teeth.

Pereopod 1 (Fig 17H) :basis 1.9 times as long as wide; ischium 0.7 time as long as basis; merus with 2 setae; carpus short, with 2 setae; propodus with 6 setae.

Pereopod 2 (Fig 17I): basis 1.9 times as long as wide; ischium half-length of basis; merus half-length of ischium; carpus short; propodus with 7 setae on inner margin.

Pereopods 3-5 (Fig. 17J to L) similar to pereopod 2, but carpus slightly longer than that of pereopod 2; propodus with 5 setae on inner margin.

Pereopod 6 (Fig 17M) similar to pereopods 3-5, but propodus with more setae on inner margin.

Pereopod 7 (Fig 17N) similar to pereopod 6, but carpus with 6 setae on inner margin, whereas at most 2 in

the preceding pairs and 2 setae on outer margin; propodus with 12 setae on inner margin.

Pleopod 1 in female (Fig 17P-Q): both rami ovoid.

Uropod (Fig 17Q): basis trapezoidal; both rami lanceolate, with many setae around the margin.

Male unknown. Host unknown.

Remarks: The present species resemble *Mothocya parvostis* Bruce, 1986, known from various waters of Japan, but the former is separated from the latter in the following features: (1) presence of numerous setae on mandibular palp, (2) presence of numerous setae on both antennae, (3) presence of numerous setae on pereopods and (4) smaller eyes.

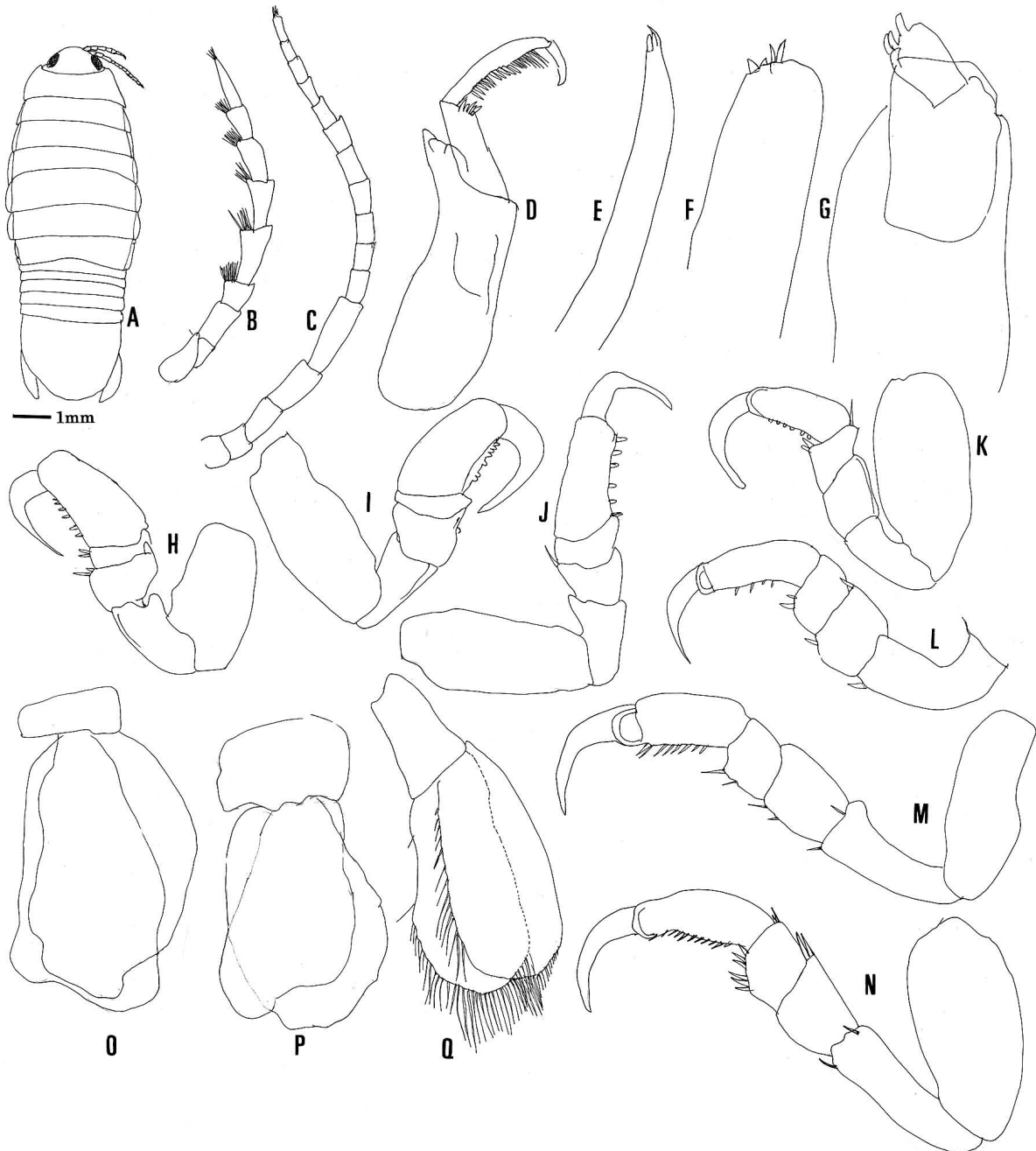


Fig. 17 *Mothocya* sp. (aff. *parvostis* Bruce, 1986)

A, Dorsal view; B, Antennule; C, Antenna; D, Mandible; E, Maxillula; F, Maxilla; G, Maxilliped; H-N, Pereopods 1-7; O-P, Pleopods 1-2; Q, Uropod(All: female from Tokushima).

Family Anthuridae
***Apanthura longiunguis* n.sp.**
(Japanese name: Nagatsume-uminanafushi, new)
(Fig.18)

Material examined: 1♂ (10.0 mm in body length), Tosa Bay, off Kochi, (33°5'41"N, 133°28'1"E, 277m in depth), during KH74-3rd cruise survey of Hakuohmaru, coll. Masuoki Horikoshi. Holotype is deposited at Toyama Science Museum (TOYA Cr-23583).

Description: Body (Fig. 18A) ellipsoid, 12 times as long as wide. Color white in alcohol. Tergites relatively thick. Anterior margin of cephalon round. Eyes lacking. Mutual length of pereonal somites is 4: 4: 5: 5: 4: 4: 2. Dorsal pit lacking. Demarcation of pleonal somites visible dorso-laterally, but indistinct in medial part. Pleotelson narrow lanceolate, 3.2 times as long as width, widest at about mid-length, with a pair of big statocysts.

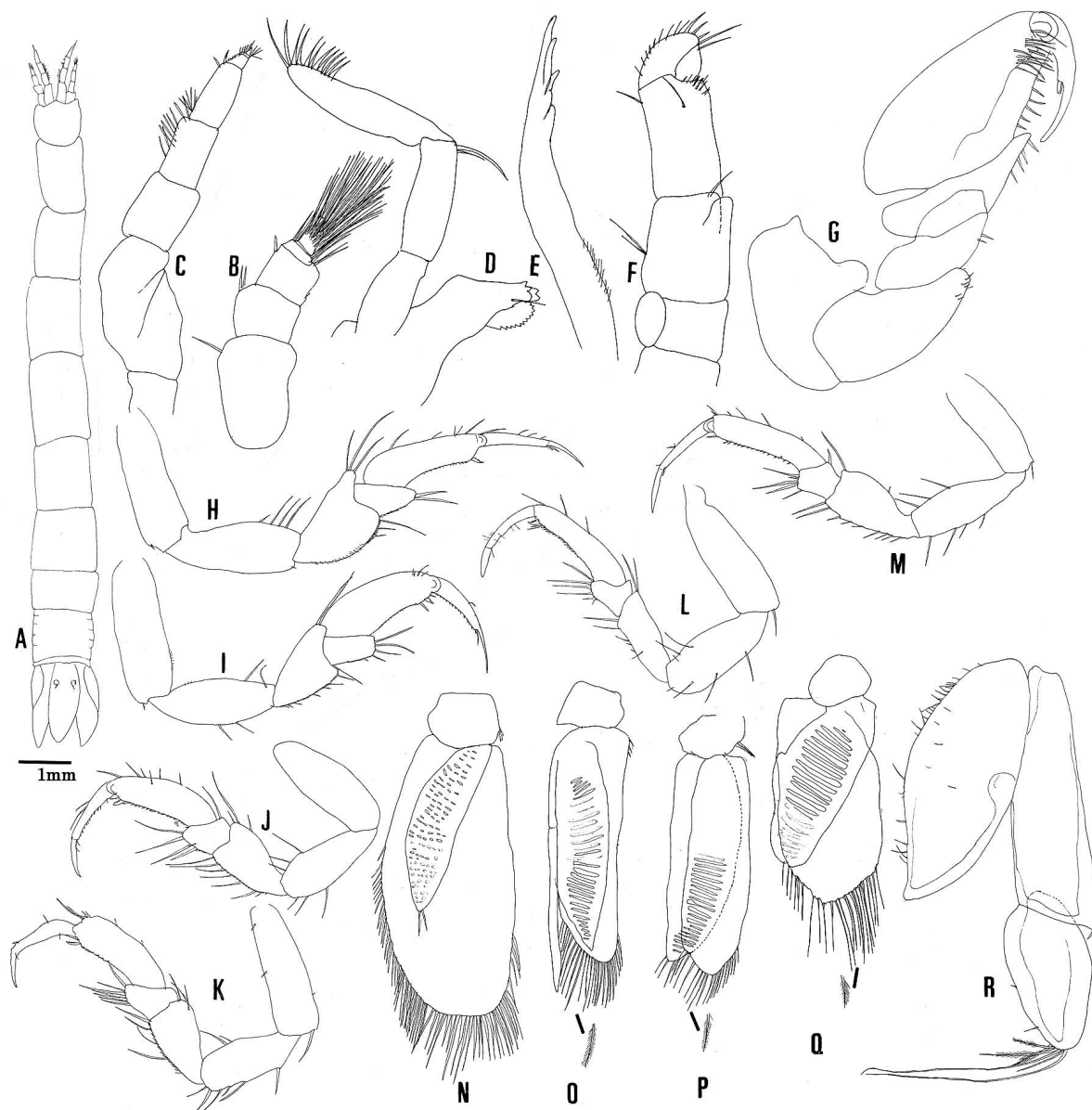


Fig. 18 *Apanthura longiunguis* n.sp.

A, Dorsal view; B, Antennule; C, Antenna; D, Mandible; E, Maxillula; F, Maxilliped; G-M, Pereopods, 1-7; N-Q, Pleopods 1-4; R, Uropod (All: holotype male).

Antennule (Fig. 18B) composed of 3 peduncular segments; flagellum short, basal two segments short, terminal segment reduced, with much setae. Antenna (Fig. 18C) composed of 5 peduncular segment, segments 3-4 short, terminal segments reduced; flagellum small and 3-segmented, and terminal segments short.

Mandible (Fig. 18D): pars incisiva 2-headed; lacinia mobilis 2-headed; lamina dentata circular-saw shaped, with 15 serrations; palp 3-segmented; terminal segment with 11 teeth. Maxillula (Fig. 18E) slender, with 4 teeth on apical area. Maxilliped (Fig. 18F) 5-segmented; terminal segment slender and round, endite present as a rounded lobe; terminal palpal segment round.

Pereopod 1 (Fig. 18G) subchelate: basis short and stout; ischium with a group of short setae on inner distal area; merus two-thirds as long as ischium; carpus triangular, with 4 setae on inner margin; propodus stout dactylus with a long outer and short inner claws.

Pereopods 2 (Fig. 18H): basis fusiform; ischium a little shorter than basis, with 4 setae on outer margin; merus a little shorter, with 3 setae on outer distal margin; carpus long triangular, with 3-4 setae; propodus as long as ischium; dactylus long, 0.8 times as long as propodus. Pereopods 3 (Fig. 18I) similar to pereopod 2, but carpus trapezoid, with 3-4 setae.

Pereopods 4-6 (Fig. 18J-M) similar: basis rectangular; ischium a little shorter than basis; merus 0.8 times as long as ischium, with 4-7 setae on inner margin and 2-4 setae on outer distal angle; carpus trapezoid, with 4-8 relatively long setae on inner margin; propodus a little shorter than ischium, with many short setae on inner margin; dactylus long, three-fourths as long as propodus.

Pereopod 7 (Fig. 18N): basis square; ischium a little longer than basis; merus with many setae on inner margin; carpus pentagonal; propodus longer than preceding ones, with 6-7 setae on outer margin; dactylus long, three-fourths as long as propodus.

Pleopod 1 (Fig. 18O): peduncle square; endopod, forming an operculum, with more than 70 setae around the margin; exopod narrow lanceolate.

Pleopod 2 (Fig. 18P): peduncle rectangular, 0.7 times longer than endopod; endopod a little longer than exopod; stylus exceeds the tips of both rami; exopod lanceolate, and shorter than endopod, with more than 30 plumose setae around margin.

Pleopod 3-5 (Fig. 18Q-R): both rami lanceolate; exopod lanceolate, and shorter than endopod, with more than 20-26 plumose setae around margin.

Uropod (Fig. 18R): peduncle 3.8 times rectangular, with a short seta at outer distal angle; endopod egg-shaped 2.0 as long as wide, with 5-6 setae including 3 plumose and 2 very long simple ones at the tip; exopod lanceolate, with 25-26 short setae on outer margin.

Female unknown.

Etymology: "longus" means "long" in Latin, "unguis" means "claw" in Latin.

Remarks: The present new species is allied to *Apanthura fusei* Nunomura, 1993 recorded from Aji-cho Kagawa Prefecture, but the former differs from the latter, (1) shorter body, (2) longer unguis of dactylus of pereopods, (3) stouter endopod uropod, (4) less numerous teeth on maxilliped, (5) longer propodus of pereopods, (6) smaller eye and (7) presence of numerous setae on all the pereopods.

The present new species is most closely allied to *Apanthura mirbelia* Poore & Lew Ton, 1985, recorded from Bass Strait, Australia, but the former is different from the latter in the following features; (1) lack of eyes, (2) smoother carpus, (3) longer unguis of dactylus of pereopods, (4) smaller statocysts on pleotelson and (5) presence of long setae at the tip of uropodal endopod.

***Apanthura fusei* Nunomura, 1993**

(Japanese name: Fuse uminanafushi)

Apanthura fusei Nunomura, 1993, p.16, fig. 1 (Enohama, Aji-cho, Kagawa Pref., from subtidal zone).

Material examined: 1♀, Enohama, Aji-cho, Kagawa Pref., Sep. 1975, coll. Shin'ichiro Fuse (holotype).

***Apanthura shikokuensis* Nunomura, 1993**

(Japanese name: Shikoku-uminanafushi)

Apanthura shikokuensis Nunomura, 1993, p.20, fig. 3 (Kizawa, Kagawa Pref., from subtidal zone).

Material examined: 1♂, Kizawa, Sakaide-shi, Kagawa Pref., Mar. 1975, coll. Shin'ichiro Fuse (holotype).

***Apanthura trioculata* Nunomura, 1993**

(Japanese name: Mitsume-uminanafushi)

Apanthura trioculata Nunomura, 1993, p.18, fig. 2 (Kagawa Pref.).

Material examined: 1♀, west of Nou-misaki, Sakaide-shi, Kagawa Pref., Feb. 1975, coll. Shin'ichiro Fuse (holotype); 1♀, Enohama, Aji-cho, Kagawa Pref., Mar. 1975, coll. Shin'ichiro Fuse (paratype); 1♀, Nishiwaki, Sakaide-shi, Kagawa Pref. Mar.1975, coll. Shin'ichiro Fuse; 7♀♀, Kizawa, Sakaide-shi, Kagawa Pref., Mar. 1975, coll. Shin'ichiro Fuse (paratype).

***Cyathura kikuchii* Nunomura, 1976**

(Japanese name: Kikuchi-sunaumjinanafushi)

Cyathura kikuchii Nunomura, 1977, p.73, figs.2-3 estuary of Tatara River, Hakozaiki, Fukuoka Pref.).

Material examined: 18♀♀, subtidal, west of Nou-misaki, Sakaide-shi, Kagawa Pref., 9, Mar. 1975, coll. Shin'ichiro Fuse; 13exs, Nishiwaki, Sakaide-shi, Kagawa Pref., Mar. 1975, coll. Shin'ichiro Fuse; 1ex, Nishiwaki, Sakaide-shi, Kagawa Pref., Feb. 1976, coll. Shin'ichiro Fuse; 1♀, Kizawa, Sakaide-shi, Kagawa Pref., Feb. 1976, coll. Shin'ichiro Fuse; 1ex, Kagawa Pref., date unknown, coll. Shin'ichiro Fuse; 1♀, 11, June 1994, mouth of Yoshinogawa, Tokushima-shi, Tokushima Pref., coll. unknown.

***Cyathura muromiensis* Nunomura, 1974**

(Japanese name: Muromi-sunauminanafushi)

Cyathura muromiensis Nunomura, 1974, p.13, figs. 1-2 (Muromi River, Fukuoka, Kyushu).

Material examined: 2♀♀, mouth of Katsuura-gawa, River, Saiga-cho, Tokushima-shi, Tokushima Pref., 19, Apr. 2003, coll. Keiji Wada; 1♀, Mouth of Katsuuragawa River, Saika-cho, Tokushima-shi, Tokushima Pref., 12, June 1994, coll. Keiji Wada; 2♀♀, mouth of Katsuura-Gawa, Sumiyoshi, Tokushima-shi, Tokushima Pref., 19, Apr. 2003, coll. Keiji Wada; 1♂, Mouth of the Yoshinogawa River, Oujimncho-higashi-sadakata, Tokushima-shi, Tokushima-Pref., 18, Apr. 2003, coll. Keiji Wada; 4♀♀ (2♀♀, ovigerous), Mouth of the Yohinogawa River, Sumiyoshi, Tokushima-shi, Tokushima Pref., 18, Apr. 2003, coll. Keiji Wada; 1♀ (ovigerous), Higashinakatomi, Aizumi-cho, Tokushima Pref., 18, Apr. 2003, coll. Keiji Wada; 30exs, Minami-maekawa-cho, Suketou-gawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki; 20exs, Hachiman-cho, Sonose-gawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki.

Family Paranthuridae

***Paranthura japonica* Richardson, 1909**

(Japanese name: Yamato-uminanafushi)

Paranthura japonica Richardson, 1909, p.77, figs. 4-5 (Mororan).

Material examined: 1♀, Sakurahama, Tatsukushi, Tosashimizu-shi, Kochi Pref., 17, May 2003; 2♀♀, Kosaiuno, Otsuki-cho, Kochi Pref., 5, June 2012, coll. Noboru Nunomura; 1♀1y, Shiuranohama, Nishidomari, Otsuchi-cho, 4, June 2012, coll. Noboru Nunomura; 1♀, Ktakasu, Tosashimizu-shi, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 3♀♀, Tsumajiro, Tosashimizu-shi, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 2♀♀, mouth of Ayakawa, Sakaide-shi, Kagawa Pref., date unknown, coll. Shin'ichiro Fuse.

***Paranthura kobensis*, Nunomura, 1975**

(Japanese name: Kôbe-uminanafushi)

Paranthura kobensis Nunomura, 1975. p25, fig. 8-9.

Material examined: 1♀, mouth of Ayakawa, Sakaide-shi, Kagawa Pref., date unknown, coll. Shin'ichiro Fuse.

***Paranthura kagawaensis* Nunomura, 1993**

(Japanese name: Kagawa-uminanafushi)

Paranthura kagawensis Nunomura, 1993 pp.24-26, fig. 5.

Material examined: 1♂, west of Nou, Sakaide-shi, Kagawa Pref., Mar. 1975, coll. Shin'ichiro Fuse (holotype).

Family Bopyridae

***Pseudione* sp.**

Material examined: 1♀, Hachiman-cho, Sonose-gawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki.

Bopyridae spp.

Material examined: 1♀, Minami-okinosu, Okinosu-gawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki; 1♀, Tatsunokushi, Tosashimizu-shi, Kochi Pref., 7, May 2003, coll. unknown.

Suborder Sphaeromatidea

Family Sphaeromatidae

***Cymodoce japonica* Richardson, 1907**

(Japanese name: Nihon-kotsubumushi)

Cymodoce japonica Richardson, 1907, p. 7, fig. 11.

Material examined: 1♀, Tatsunokushi, Tosashimizu-shi, Kochi Pref., 7, May 2003, coll. The Biological Institute on Kuroshio (BIK); 1♀, Sakura, Tatsukushi, Tosashimizu-shi, Kochi Pref., 17 May 2003, coll. The Biological Institute on Kuroshio (BIK); 2exs, Kamano, Aji-cho, Kagawa Pref., Feb. 1975, coll. Shin'ichiro Fuse *et al.*; 3♀, Aji-cho, Kagawa Pref., Feb. 1976, coll. Shin'ichiro Fuse *et al.*

***Cymodoce acuta* Richardson, 1904**

(Japanese name: Futotoge-kotsubumushi)

Cymodoce acuta Richardson, 1904, p. 38, figs. 8-10 (Yeno-ura, taken on the surface).

Material examined: 4♂♂22♀♀, pearl oyster farms of Shirigai, Otuski-cho, Kochi Pref., 16, Apr. 1991, coll. Keiichi Nomura; 1♀, Enohama, Aji-cho, Kagawa Pref., Feb. 1975, coll. Shin'ichiro Fuse; 2♂♂, Kamano, Aji-cho, Kagawa Pref., Feb. 1975, coll. Shin'ichiro Fuse *et al.*

***Gnorimosphaeroma rayi* Hoestlandt, 1969**

(Japanese name: Iso-kotsubumushi)

Sphaeroma oregonensis Dana, 1852, p. 778, pl. 52, fig. 4.

Exosphaeroma oregonensis, Richardson, 1905, p. 296, figs. 315-316.

Gnorimosphaeroma rayi Hoestlandt, 1969, p. 325.

Material examined: 1♂, Nishiwaki, Sakaide-shi, Kagawa Pref., coll. Shin'ichiro Fuse *et al.*; 2♀♀, Tachibana-Bay, Anan-shi, Tokushima Pref., 12, Oct. 1992, coll. M. Kojima.

***Gnorimosphaeroma* sp. (aff. *ovatum* (Gurjanova, 1933))**

Material examined: 1♂1♀, mouth of Yoshinogawa, Tokushima-shi, Naruto-shi, Tokushima, 1♂3♀, Higashisenba-cho, Shinmachi-gawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki; 1♂5♀ 5youngs, Minami-okinosu, Okinosu-gawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki; 40exs, Minamimaekawa-cho, Suketougawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki; 22exs, Hachiman-cho, Sonose-gawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki.

***Sphaeroma shimantoensis* Nunomura 2003**

(Japanese name: Shimanto-kotsubumushi)

Sphaeroma shimantoensis, Nunomura 2003, 47-50, figs. 1-2.

Material examined: 5♀♀, Nakamura, Shimanto-shi, Kochi Pref., coll. Keiji Wada *et al.* (type series).

***Sphaeroma retrolaevis* Richardson, 1904**

(Japanese name: Yotsuba-kotsubumushi)

Sphaeroma retrolaevis Richardson, 1904, p.47, fig.23 (Nagasaki; Hizen).

Material examined: 5♀♀, mouth of Yoshinogawa, Tokushima-shi, Tokushima Pref., 17, Apr. 2003, coll. Keiji Wada.

***Sphaeroma wadai* Nunomura, 1994**

(Japanese name: Iwahori-kotsubumushi)

Sphaeroma wadai Nunomura, 1994a, p. 1, fig. 1-2 (Uchinoura, Tanabe Bay, Wakayama Pref.).

Material examined: 3♀♀, mouth of Yoshinogawa, Kofu-cho, Tokushima-shi, Tokushima Pref., 18, Apr. 2003, coll. Keiji Wada.

***Chitonosphaera lata* (Nishimura, 1986)**

(Japanese name: Habahiro-kotsubumushi)

Gnorimosphaeroma lata Nishimura, 1968, p.273, figs. 1-5 (Seto, Shirahama, Wakayama Pref.).

Gnorimosphaeroma latum, Nunomura & Nishimura, 1976, p.24, fig. 3 (Misaki-cho, Osaka Pref.,

Chitonosphaeroma lata, Kussakin, 1993, pp.1196-1999.

Material examined: 1♂, Ado-ike, Hiketa, Higashigawaga-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 10exs, Minamimaekawa-cho, Suketougawa, Tokushima-shi, Tokushima Pref., 15, July 2003, coll. Mitsuo Hosoki; 6exs, Hachiman-cho, Sonose-gawa, Tokushima-shi, Tokushima Pref., 15, July, 2003, coll. Mitsuo Hosoki; 1♀2youngs, Itsukushima, Saga, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 1♂, Shirahama, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 5♂♂, Hirao, Muroto-shi, Kochi Pref., 26, May 2013, coll. Noboru Nunomura; 1♀, Okazaki, Naruto-shi, Tokushima Pref., 14, May 1998, coll. Noboru Nunomura; 1♂1♀, Ooyama fishery port, Kurohae, Ooyama-cho, Aki-shi, Kochi Pref., 20, May 2011, coll. Noboru Nunomura; 5♂♂1♀, Kamikawagi-cho, Koroshio-cho, 5, June 2012, coll. Noboru Nunomura; 2♂♂2♀♀, Shiuranohama, Nishidomari, Ootsuki-cho, Kochi Pref., 17, May 2011, coll. Shu Nakachi; 5♂♂3♀♀, Shiuranohama, Nishidomari, Ootsuki-cho, Kochi Pref., 4, June 2012, coll. Noboru Nunomura; 1♀, Okazaki, Satoura, Satoura-cho, Tokushima-Pref., 1, May 1998, coll. Noboru Nunomura.

***Chitonosphaera salebroza* (Nishimura, 1969)**

(Japanese name: Yoroi-kotsubumushi)

Gnorimosphaeroma salebrosum Nishimura, 1969b, p.385, figs. 1-5 (Shirahama; Wakayama Pref.).

Chitonosphaeroma salebroza, Kussakin, 1993, pp.1196.

Material examined: 1♂, Tsumajiro, Tosashimizu-shi, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 3♀♀,

Shiuranohama, Nishidomari, Ootsuki-cho, Kochi Pref., 17, May 2011, coll. Noboru Nunomura; 2♀♀, Nishidomari, Ootsuki-cho, Kochi Pref., 18, May 2011, coll. Noboru Nunomura; 6♀♀, Shiuranohama, Nishidomari, Ootsuki-cho, Kochi Pref., 4, June 2012, coll. Noboru Nunomura; 1♂, Nada, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 3♂♂2♀♀, Takega-shima, Kaiyo-cho, Tokushima Pref., 19, May 2011, coll. Noboru Nunomura; 2♂♂, Mitsu, Naruto-shi, Tokushima Pref., 25, May 2013, coll. Noboru Nunomura; 1ex, Kamikawaguchi, Kuroshio-cho, 25, June 2012, coll. Noboru Nunomura.

***Dynoides dentisinus* Shen, 1929**

(Japanese name: Shiriken-umisemi)

Dynoides dentisinus Shen, 1929, p.65, figs.1-23 (Pechihli Bay to Tsingto, China).

Material examined: 1♀, Tatsukushi, Tosashimizu-shi, Kochi Pref., 7, May 2003, coll. The Biological Institute on Kuroshio (BIK); 1♂, Okazaki, Naruto-shi, Tokushima Pref., 14, May 1998, coll. Noboru Nunomura.

***Dynoides artocanalis* Nunomura, 1997**

(Japanese name: Hosomizo-umisemi)

Dynoides artocanalis Nunomura, 1997 p.73, figs.1-2 (Tachibana Bay, Tokushima Pref.).

Material examined: 2♂♂1♀, Anan-shi, Tokushima Pref., 16, May 1991, coll. Michio Otani (Type series).

***Cymodocella nipponica* Nishimura, 1969**

(Japanese name: Tsutsuo-umisemi)

Cymodocella nipponica Nishimura, 1969, p.335, figs 1-5 (Tanabe Bay, Wakayama Pref.)

Material examined: 1♂, Tatsukushi, Tosashimizu-shi, Kochi Pref., 18, May 2003, coll. The Biological Institute on Kuroshio (BIK); 2♂♂, Inojiri, Usa, Tosa-shi, Kochi Pref., 6, June 2011, coll. Noboru Nunomura; 10♂♂12♀♀, Shiuranohama, Nishidomari, Otsuki-cho, Kochi Pref., 17, May 2011, coll. Shu Nakachi.

***Dynamenella laticauda* Nunomura, 1999**

(Japanese name: Kanae-umisemi)

Dynamenella laticauda Nunomura, 1999, pp.21-24, fig. 7 (Hachijo Island).

Material examined: 2♂♂2♀♀, Inojiri, Usa, Tosa-shi, Kochi Pref., 5, June 2012, coll. Noboru Nunomura; 2♂♂2♀♀, Katakasu, Tosashimizu-shi, Kochi Pref., 5, June 2012, coll. Noboru Nunomura; 1♀, Nishidomari, Otsuki-cho, Kochi Pref. 4, May 2011, coll. Noboru Nunomura.

***Holotelson tuberculatus* Richardson, 1909**

(Japanese name: Chibi-umisemi)

Holotelson tuberculatus Richardson, 1909, p.93, figs.17-20 (Mororan, on the shore).

Material examined: 2♂♂1♀, Tatsukushi, Tosashimizu-shi, Kochi Pref., 7, May 2003, coll. The Biological Institute on Kuroshio (BIK); 1♀, Nishiwaki, Sakaide-shi, Kagawa Pref., date unknown, Pref. coll. Shin'ichiro Fuse *et al.*

***Leptosphaeroma gottschei* Hilgendorf, 1885**

(Japanese name: Hirata-umisemi)

Leptosphaeroma Gottschei Hilgendorf, 1885, p.185 (Mogi; Kyushu).

Leptosphaeroma gottschei, Nishimura, 1976a, p.169, figs.1-26 (Osaka Bay).

Material examined: 1♀, Ado-ike, Hiketa, Higashigkawaga-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 7♂♂3♀♀, Ado-port, Hiketa, Higashigkawaga-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura; 6♂♂4♀♀, Naruto-shi, Tokushima Pref., 25, May 2013, coll. Noboru Nunomura; 2♀♀, Tainohama, Tai, Minami-cho, Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1♂1♀, Yasakayahama, Asaka, Kaiyo-cho,

Tokushima Pref., 26, May 2013, coll. Noboru Nunomura; 1♂2♀♀, Kashimagaura, Saga, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 2♀♀, Itsukushima, Saga, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 3♂♂2♀♀, Shirahama, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 8♂♂4♀♀, Nada, Kuroshio-cho, Kochi Pref., 27, May 2013, coll. Noboru Nunomura; 2♂♂6♀♀1 youngs, Nishidomari, Otsuki-cho, Kochi Pref. 4, June 2012, coll. Noboru Nunomura; 7♂♂2♀♀, Tsumajiro, Tosashimizu-shi, Kochi Pref., 28, May 2013, coll. Noboru Nunomura; 4♂♂4♀♀, Kosaitsumo, Tosashimizu-shi, Kochi Pref., 5, June 2012, coll. Noboru Nunomura; 7♂♂4♀♀, Nishidomari, Otsuki-cho, Kochi Pref., 17, May 2011, coll. Noboru Nunomura; 1♂1♀, Koura, Sukumo-shi, Kochi Pref., 18, May 2011, coll. Noboru Nunomura.

Suborder Valvifera

Family Idoteidae

Cleantiella isopus (Grube, 1883)

(Japanese name: Iso-heramushi)

Cleantis isopus Grube in Miers, 1883, p.80, pl.3, figs.9-11 (Ojica, Goto I. (lat. 33°12' 30" N, long. 129°5' E)).

Material examined: 3♂♂3♀♀, Murou, Shodoshima-cho, Kagawa Pref., May 2013, coll. Noboru Nunomura; 1♂1♀, Nakayoshima, Tonosho-cho, Kagawa Pref., May 2013, coll. Noboru Nunomura.

Cleantiella strasseni (Thielemann, 1910)

(Japanese name: Ohiraki-heramushi)

Cleantis Strasseni Thielemann, 1910, p. 67, figs. 73-75 (Yokohama).

Cleantiella strasseni, Iwasa, 1957, p. 812, fig. 2339.

Material examined: 3♀♀, Tatsukushi, 7, May 2003 coll. The Biological Institute on Kuroshio (BIK); 1♀, Murou, Shodoshima-cho, Kagawa Pref., 24 May 2013, coll. Noboru Nunomura; 1♀, Nakayoshima, Tonosho-cho, Kagawa Pref., May 2013, coll. Noboru Nunomura; 1♂2♀♀, Ado-port, Hiketa, Higashikawaga-shi, Kagawa Pref., 25, May 2013, coll. Noboru Nunomura.

Synidotea laevidorsalis (Miers, 1881)

(Japanese name: Waraji-heramushi)

Edotea hirtipes var. *laevidorsalis* Miers, 1881, p.69, pl.3, figs.1-2.

Synidotea laevidorsalis Benedict, 1897, p.403.

Material examined: 1♀, Kizawa, Sakaide-shi, Kagawa Pref., Mar. 1975, coll. Shin'ichiro Fuse, *et al.*

Paridotea robusta Nunomura, 1985

(Japanese name: Mononofu-heramushi)

Paridotea robusta 1985, p.125, figs.3-4 (Yoshitsune-iwa, Amaharashi, Toyama Bay).

Material examined: 1♂1♀. Tachibana-cho, Anan-shi, Tokushima Pref., Feb. 1992, coll. Michio Otani.

Family Holognathiidae

Cleantioides sp. (aff. *japonica* (Richardson, 1912))

(Fig.19)

Material examined: 1young ♂ (4.0mm, in body length) and 2 young♀♀ (3.0-3.1mm, in body length), 20m in depth, Tosa-Bay, 17, Nov. 1975, coll. unknown. These specimens are deposited at Toyama Science Museum (TOYACr-23599-23601).

Description; Body (Fig.19A) ellipsoid, 5.6 times as long as wide. Color pale yellow with many irregular paler patterns. Anterior margin of cephalon. Eyes round, mediocre in size; each eye with 15 ommatidia. Pereonal somite parallel. Pleotelson, 1.7 times as long as wide, with 3 perfect and an imperfect suture lines; without medial

tubercles. No remarkable sculpture or elevation on dorsal surface on pleotelson; posterior margin of pleotelson rounded.

Antennule (Fig 19B) small and composed of 3 peduncular segments and a flagellar segment. Antenna (Fig 19C) composed of 5 peduncular segments and a flagellar segment.

Left mandible (Fig 19D): pars incisiva with 4 teeth; lacinia mobilis with 3 teeth; 4 penicils; processus molaris wide. Maxillula (Fig. 19E): mesial endite with 2 projections; lateral endite with 11 teeth at the tip, three of them serrate. Maxilla (Fig. 19F) mesial lobe with 9-11 setae; each middle and lateral ramus of exopod with four setae. Maxilliped (Fig 19G): palp 4-segmented; second segment wide, only a faint transverse line observed in middle part; third segment slender; terminal segment small and semicircular, endite with a coupling hook.

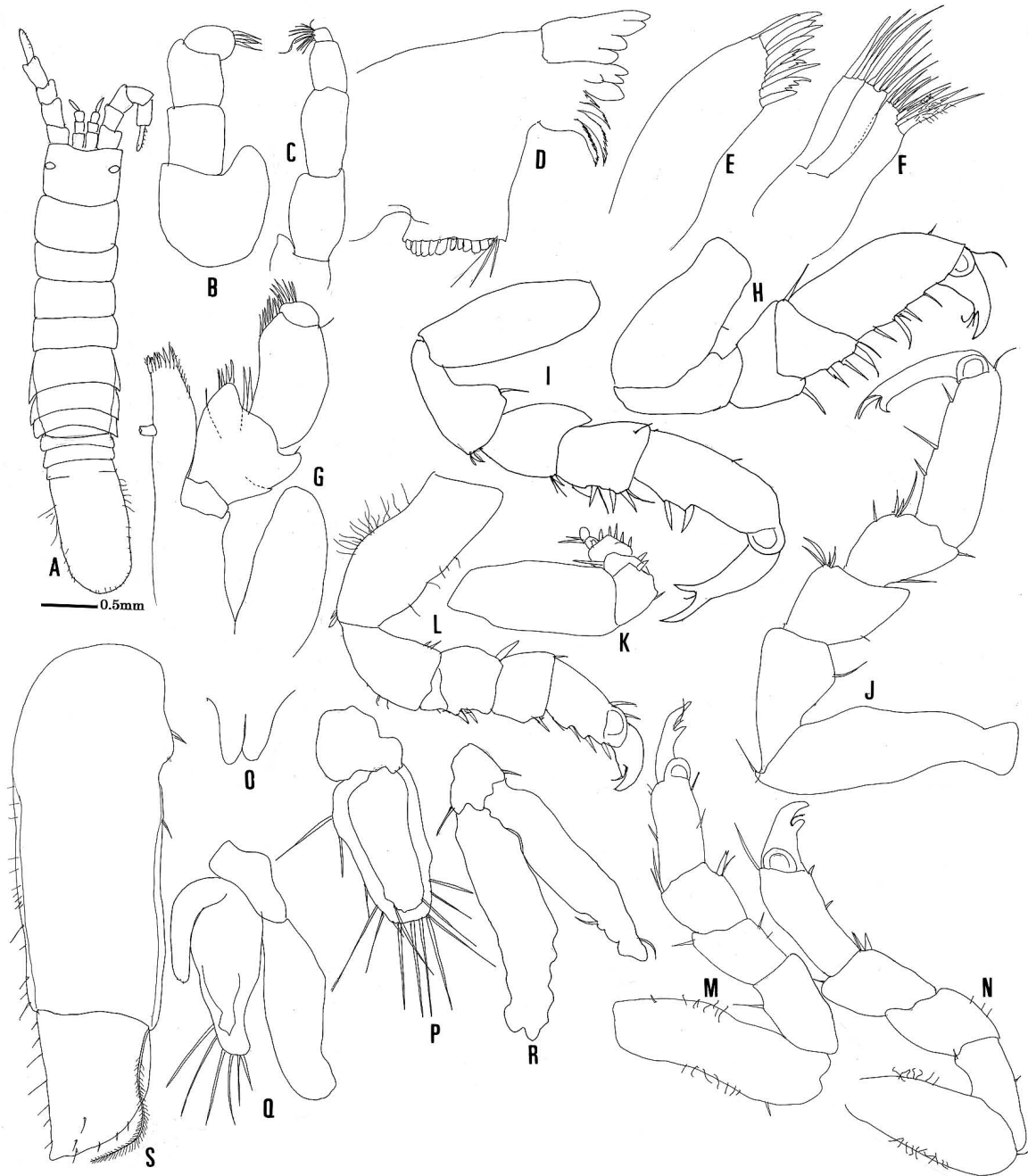


Fig. 19 *Cleantioides* sp. (aff. *japonica* (Richardson, 1912))

A, Dorsal view; B, Antennule; C, Antenna; D, Mandible; E, Maxillula; F, Maxilla; G, Maxilliped; H-N, Pereopods 1-7; O, Penes; P-R, Pleopods 1-3; S, Uropod (All: male from Tosa Bay).

Pereopod 1 (Fig 19H): basis 2.3 times as long as wide; ischium two-thirds as long as basis; merus rather short; carpus triangular, with 3 setae on inner margin; propodus with 5-6 setae on inner margin.

Pereopod 2 (Fig 19I): basis rectangular, 2.3 times as long as wide; ischium two-thirds as long as basis; merus square, with 4-5 setae on inner margin; carpus square, with 5-6 seta on inner margin; propodus rather stout, with 2 setae on inner margin.

Pereopod 3 (Fig 19J) similar to pereopod 2, but with less numerous setae on each segment.

Pereopod 4 (Fig 19K): much reduced: basis rectangular, 2.4 times as long as wide; ischium short, with 2 setae; merus very short, with 2 setae; carpus short, with 6 setae; propodus and dactylus small.

Pereopod 5 (Fig 19L) larger than pereopod 4, but a little shorter than other pereopods: basis with many seta both margins; propodus with 3 setae on inner margin.

Pereopod 6-7 (Fig 19M-N): basis 2.6-2.9 times longer than the preceding ones, with several thin setae on both margin, with 2 setae on inner margin; ischium three-fifths as long as basis; merus and carpus square; propodus 1.5 times longer than carpus.

Penes (Fig 19O), relatively short, each 2.4 times as long as wide.

Pleopod 1 (Fig 19P): peduncle almost square; both rami rectangular, endopod with a dozen long setae.

Pleopod 2 (Fig 19Q): peduncle rectangular; endopod rectangular, with 6 setae; stylus 0.7 times as long as endopod; exopod rectangular.

Pleopod 3 (Fig 19R): peduncle pentagonal; both rami slenderer and less setose, than those of pereopods 1-3.

Uropod (Fig 19R) uniramous: basis rectangular, 2.5 times as long as wide, with a long seta at the distal outer angle; endopod quadrant; exopod absent.

Remarks: The present specimens are allied to *Clenatioides planicauda* (Benedict, 1899). The former is separated from the later in the following features: (1) strongly reduced pereopod 4, (2) longer pleotelson, (3) bigger palpal palp of maxilliped, (4) convex tip of penes, (5) less numerous setae on pereopods, (6) less numerous coupling hooks on maxilliped, (7) longer pleopod 3, and (8) shorter stylus of male pleopod 2. These specimens are also allied to *Clenatioides japonicum*, but differ from the latter in the following features: (1) absence of medial tubercles on pleotelson, (2) less numerous teeth of maxilliped and (3) shape of maxillipedal palp.

The present specimens are considered to be a juvenile form, therefore, I refrained to establish new species.

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Corrections

In the previous paper, some mistakes were slipped in:

p.43, l.40, for “sixth pereopod” read “seventh pereopod”

p.76, l.7. for “*Synisoma pacifica*”, read “*Synisoma pacificum*”.

p.37, l 41, p.42.l.2 and p.49, l.5, for “glooming” read “grooming”.

p.75, l.18, for “Tecticepitidae” read “Tecticipitidae”. But, *Leptosphaeroma gottschei* Hilgendorf, 1885 should have been included in the family Sphaeromatidae.